SIEMENS

AXIOM Sensis XP

[redacted] AX

DICOM Conformance Statement

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1 Introduction

1.1 Overview

The Conformance Statement describes the DICOM interface for the Siemens AXIOM Sensis XP in terms of part 2 of [DICOM].

This introduction describes the application's implemented DICOM functionality in general terms.

1.2 Scope and Field

The AXIOM Sensis XP is a "*syngo*®-speaking[a]" Cardiac Interventional System for Acquisition and Viewing of Waveform data during a catheterization procedure. The AXIOM Sensis XP is designed to be integrated into an environment of medical DICOM-based devices. The AXIOM Sensis XP DICOM network implementation acts as SCU and SCP for the DICOM Storage and Query/Retrieve services and as SCU for the DICOM Basic Worklist and Storage Commitment Services. The primary purpose for supporting DICOM image storage in AXIOM Sensis is for the ability to include images in the reports. Clinical reports can also be converted to DICOM XA multiframe images to be sent over the network or stored on media. Neither image viewing, nor viewing of foreign DICOM waveform objects is supported in this release. Verification is supported in SCU (only via Service environment) and SCP role. Furthermore the handling of CD offline media is supported as a FSC, FSU and FSR.

Software Name	SIEMENS AXIOM Product
AXIOM Sensis XP	AXIOM Sensis XP product family

Table 1 List of products applicable to this Conformance Statement

1.3 Audience

This document is intended for hospital staff, health system integrators, software designers or implementers. It is assumed that the reader has a working understanding of DICOM.

1.4 Remarks

DICOM, by itself, does not guarantee interoperability. However, the Conformance Statement facilitates a first-level validation for interoperability between different applications supporting the same DICOM functionality as SCU and SCP, respectively.

This Conformance Statement is not intended to replace validation with other DICOM equipment to ensure proper exchange of information intended.

The scope of this Conformance Statement is to facilitate communication with Siemens and other vendors' Medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM 3.0 Standard [DICOM]. However, by itself it is not guaranteed to ensure the desired interoperability and a successful interconnectivity.

The user should be aware of the following important issues:

- The comparison of different conformance statements is the first step towards assessing interconnectivity between Siemens and non-Siemens equipment.
- Test procedures should be defined and tests should be performed by the user to validate the connectivity desired. DICOM itself and the conformance parts do not specify this.

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- The standard will evolve to meet the users' future requirements. Siemens is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue its delivery.
- Siemens reserves the right to modify the design and specifications contained herein without prior notice. Please contact your local Siemens representative for the most recent product information.

1.5 Definitions, Terms and Abbreviations

Definitions, terms and abbreviations used in this document are defined within the different parts of the DICOM standard.

Additional Abbreviations and terms are as follows:

ACR	American College of Radiology
AE	DICOM Application Entity
ASCII	American Standard Code for Information Interchange
CSE	Customer Service Engineer
DB	Database
DCS	DICOM Conformance Statement
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DIMSE-C	DICOM Message Service Element with Composite Information Objects
DIMSE-N	DICOM Message Service Element with Normalized Information Objects
DSA	Digital Subtraction Angiography
IIDC	Image-Intensifier Distortion Correction
IOD	DICOM Information Object Definition
ISO	International Standard Organization
NEMA	National Electrical Manufacturers Association
O	Optional Key Attribute
PDU	DICOM Protocol Data Unit
R	Required Key Attribute
RIS	Radiology Information System
RWA	Real-World Activity
SCP	DICOM Service Class Provider (DICOM server)
SCU	DICOM Service Class User (DICOM client)
SOP	DICOM Service-Object Pair
U	Unique Key Attribute

1.6 References

[DICOM] Digital Imaging and Communications in Medicine (DICOM), NEMA PS 3.1-3.18, 2008

1.7 Structure

This Conformance Statement is subdivided into multiple Parts, which relate to individual documents needed to declare Conformance according to the requirements of "Part 2 - Conformance" of the DICOM Standard.

Those parts are:

- "Network Conformance Statement" for Network related Services
  - Storage - User/Provider (includes Verification - User/Provider)
  - Storage Commitment - User

- Query/Retrieve - User/Provider
- Basic Worklist - User

- "Offline Media Conformance Statement" to support local archive media.
- A general Appendix.

2 Implementation Model Verification

The AXIOM Sensis XP DICOM Service Tool application requests Verification to verify the ability of a foreign DICOM application on a remote node to respond to DICOM messages.

Responding to Verification requests from remote nodes is handled by the Storage SCP application.

2.1 Application Data Flow Diagram

The AXIOM Sensis XP DICOM network implementation acts as SCU and via the Storage SCP application as SCP for the C-ECHO DICOM network service. The product target Operating System is Microsoft Windows XP.

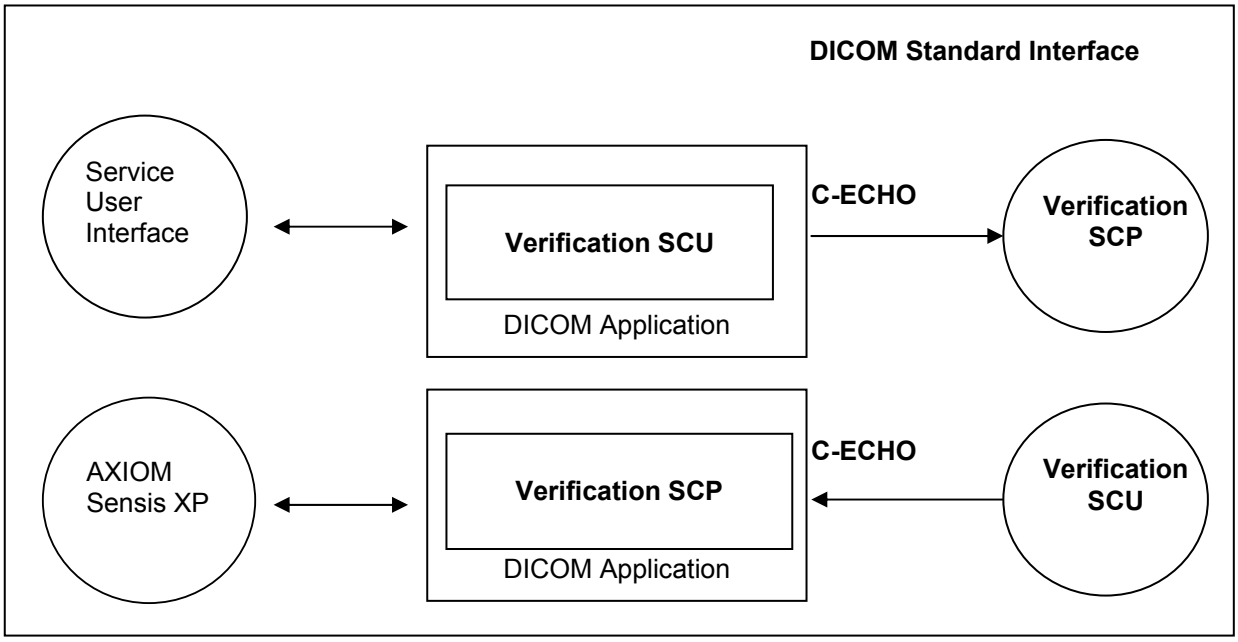

Figure 1 Application Data Flow Diagram - Verification SCU/SCP

2.2 Functional Definitions of Applications

The AXIOM Sensis XP DICOM Service Tool application opens an association when a “verification” of a remote application is requested during a configuration session. This can be done when entering new data for remote application configuration or to verify existing configuration data.

2.3 Sequencing of Real-World Activities

Newly entered data have to be saved first, before a “verification” of these data is possible.

3 Application Entity Specification Verification

3.1 Verification AE Specification

3.1.1 Association Establishment Policies

3.1.1.1 General

The AXIOM Sensis XP DICOM Service Tool application attempts to open an association for verification request whenever the “verification” function is activated during network configuration of a remote DICOM application.

The AXIOM Sensis XP DICOM application will accept association requests for verification.

3.1.1.2 Number of Associations

The AXIOM Sensis XP DICOM Service Tool application initiates one association at a time to request verification.

The AXIOM Sensis XP DICOM application is able to accept multiple associations at a time. It can handle up to 10 associations in parallel.

3.1.1.3 Asynchronous Nature

The AXIOM Sensis XP DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

3.1.1.4 Implementation Identifying Information

Implementation Class UID	1.3.12.2.1107.5.9.20000101
Implementation Version Name	SIEMENS_SWFVE31F

Table 2 Implementation Identifying Information

3.1.2 Association Initiation Policy

The AXIOM Sensis XP DICOM Service Tool application attempts to initiate a new association for

- DIMSE C-ECHO

service operations.

3.1.2.1 Associated Real-World Activity - Verification

3.1.2.1.1 Associated Real-World Activity – Request Verification

The associated Real-World activity is a C-ECHO request initiated by Service and Configuration SW environment whenever a “verification” is requested. If an association to a remote Application Entity is successfully established, Verification with the configured AET is

requested via the open association. If the C-ECHO Response from the remote Application contains a status other than “Success” this will be indicated in the service environment and the association is closed.

3.1.2.1.2 Proposed Presentation Contexts

The AXIOM Sensis XP DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table – Verification SCU					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Table 3 Proposed Presentation Contexts

3.1.2.1.3 SOP Specific Conformance – Verification SCU

The Application conforms to the definitions of the Verification SCU in accordance to the DICOM Standard.

3.1.3 Association Acceptance Policy

As mentioned above, the Verification SCP is part of the Storage SCP – see section 5.1.3.

4 Implementation Model Storage

The AXIOM Sensis XP DICOM Application Entity both originates associations for Storage of DICOM Composite Information Objects in Remote Application Entities and accepts association requests for Storage from Remote Application Entities.

4.1 Application Data Flow Diagram

The AXIOM Sensis XP DICOM network implementation acts as SCU and SCP for the C-STORE DICOM network service and as SCP for the C-ECHO DICOM network service. The product target Operating System is Microsoft Windows XP.

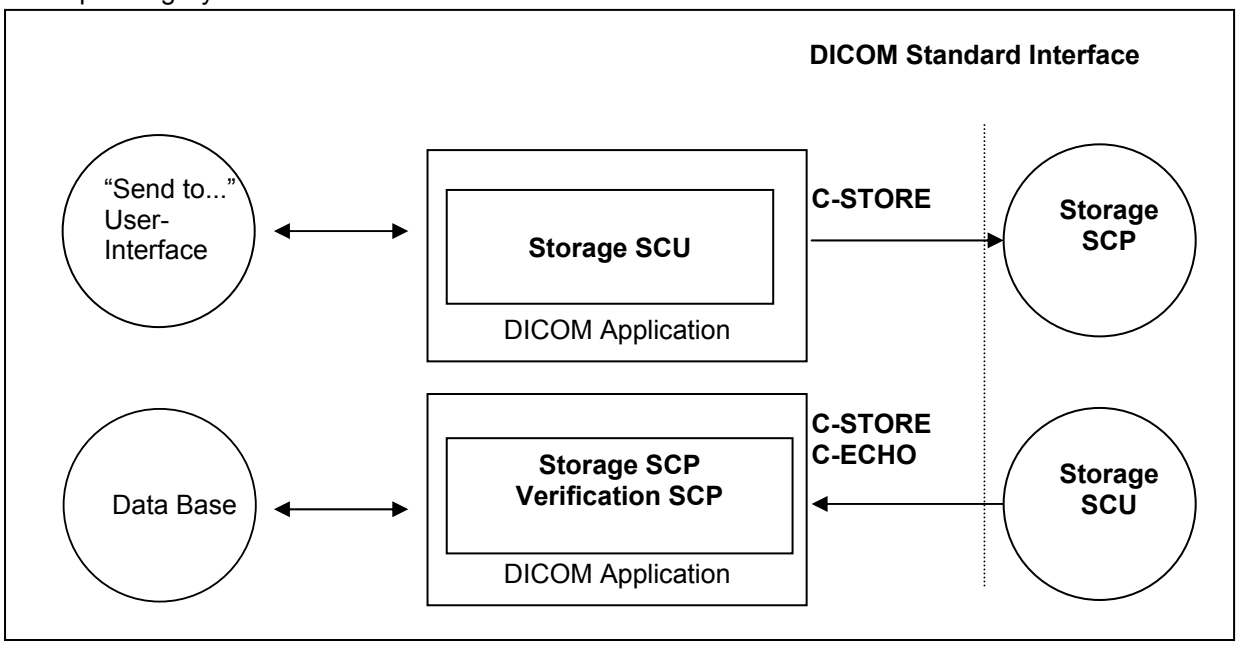

Figure 2 Application Data Flow Diagram – Storage SCU/SCP

4.2 Functional Definitions of Application Entities

The Storage SCU is invoked by the job control interface that is responsible for processing network archival tasks. The job consists of data describing the composite image objects selected for storage and the destination. An association is negotiated with the destination application entity and the image data is transferred using the C-STORE DIMSE-Service. Status of the transfer is reported to the job control interface.

The Storage SCP component of the AXIOM Sensis XP DICOM application is operating as background server process. It is running when the machine is powered on and waits for Storage association requests. Upon accepting an association with a negotiated Presentation Context it starts to receive the Composite Image Objects and imports them to local database. Verification requests will be processed and responded by Storage SCP component, too.

4.3 Sequencing of Real-World Activities

Not applicable.

5 Application Entity Specification Storage

5.1 Storage AEs Specification

The AXIOM Sensis XP Storage service class user/service class provider applications use one AE when initiating/receiving associations to/from remote DICOM nodes.

SIEMENS AXIOM Sensis XP DICOM products provide Standard Conformance to the following DICOM SOP Classes as an SCU:

SOP Class Name	SOP Class UID
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1
X-Ray **A**ngiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1

Table 4 Supported SOP Classes as an SCU

SIEMENS AXIOM Sensis XP DICOM products provide Private Conformance to the following DICOM V3.0 conform private SOP Classes as an SCU:

SOP Class Name	SOP Class UID
CSA Non-Image Storage	1.3.12.2.1107.5.9.1

Table 5 Supported private SOP Classes as an SCU

SIEMENS AXIOM Sensis XP DICOM products provide Standard Conformance to the following DICOM V3.0 SOP Classes as an SCP:

SOP Class Name	SOP Class UID
Cardiac Electrophysiology Waveform Storage	1.2.840.10008.5.1.4.1.1.9.3.1
X-Ray **A**ngiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1
Verification	1.2.840.10008.1.1

Table 6 Supported SOP Classes as an SCP

SIEMENS AXIOM Sensis XP DICOM products provide Private Conformance to the following DICOM-conform private SOP Classes as an SCP:

SOP Class Name	SOP Class UID
CSA Non-Image Storage	1.3.12.2.1107.5.9.1

Table 7 Supported private SOP Classes as an SCP

5.1.1 Association Establishment Policies

5.1.1.1 General

The existence of a job queue entry with network destination or an internal trigger from processing a retrieve request will activate the DICOM Storage Application. An association request is sent to the destination AE and upon successful negotiation of a Presentation Context the transfer is started.

The default PDU size used will be 256 KB.

5.1.1.2 Number of Associations

The AXIOM Sensis XP DICOM application initiates several associations at a time, one for each destination to which a transfer request is being processed in the active job queue list.

The AXIOM Sensis XP DICOM application is able to accept multiple associations at a time. It can handle up to 10 associations in parallel.

The number of Simultaneous DICOM associations can be configured via the Service-UI. The dialog can be found in Configuration / DICOM / General.

5.1.1.3 Asynchronous Nature

The AXIOM Sensis XP DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

5.1.1.4 Implementation Identifying Information

Implementation Class UID	1.3.12.2.1107.5.9.20000101
Implementation Version Name	SIEMENS_SWFVE31F

Table 8 Implementation Identifying Information

5.1.2 Association Initiation Policy

If a job with network destination gets active in the job list or a retrieve sub-operation is processed the AXIOM Sensis XP DICOM application attempts to initiate a new association for

- DIMSE C-STORE

service operations.

5.1.2.1 Associated Real-World Activity - Send

5.1.2.1.1 Associated Real-World Activity – Send Image Objects to a Network Destination

The associated Real-World activity is a C-STORE request initiated by an internal daemon process triggered by a job with network destination or the processing of an external C-MOVE

retrieve request. If the process successfully establishes an association to a remote Application Entity, it will transfer each image one after another via the open association. If the C-STORE Response from the remote Application contains a status other than “Success” or “Warning”, the association is aborted.

5.1.2.1.2 Proposed Presentation Context – Send Objects

The AXIOM Sensis XP DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
X-Ray **A**ngiographic Image	1.2.840.10008.5.1.4.1.1.12.1	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossless, Process 14 (selection value 1) JPEG Lossy Baseline (Process 1) JPEG Lossy Extended (Process 2 & 4) Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.2	SCU	None
Cardiac Electrophysiology Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.3.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
CSA Non-Image	1.3.12.2.1107.5.9.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

Table 9 Proposed Presentation Context – Send Images

5.1.2.1.3 SOP specific Conformance to Storage SOP classes

The AXIOM Sensis XP application will create XA IOD type images from the reporting application. Furthermore a private "Non-Image IOD" will be used to store presentation data and textual report data (Examination Log). The XA IOD will be a "Standard Extended XA Storage" SOP Class. The XA IOD will be a "Standard Extended XA Storage" SOP Class.

The AXIOM Sensis XP (DICOM) application will not change private attributes as long as no modification is done. During a “Save As…" operation all private attributes not defined within the AXIOM Sensis XP DICOM application will be removed when the new object instance is created.

For association and DIMSE level time-outs, please refer to Configuration section of this document.

5.1.2.1.3.1 Specialized Information Object Definitions

The DICOM images created by AXIOM Sensis XP DICOM application conform to the DICOM IOD definitions (Standard extended IODs). But they will contain additional private elements, which have to be discarded by a DICOM system when modifying the object.

The DICOM nodes are responsible for data consistency when modifying images. All unknown private attributes have to be removed upon modification!

5.1.2.1.3.2 Data Dictionary of applied private IOD Attributes

Please see chapter A.4 in the Annex for a list of possible private IOD attributes.

5.1.2.1.3.3 Image Pixel Attribute Description for Grayscale Images

The Siemens AXIOM Sensis DICOM application supports the Monochrome2 Photometric Interpretation with the unsigned integer 16 bit grayscale pixel and graphic overlay format. The lower 12 bits are used for pixel and the higher 4 bits are used for the graphic overlay:

Pixel plane

- samples per pixel (attribute 0028, 0002) = 1
- photometric interpretation (attribute 0028,0004) = "MONOCHROME2"
- pixel representation (attribute 0028, 0103) = 0
- bits allocated (attribute 0028, 0100) = 8, 16
- bits stored (attribute 0028,0101) = 8, 10, 12
- high bit (attribute 0028,0102) = 7, 9, 11

Overlay plane

- overlay type (attribute 60xx, 0040) = "G"
- bits allocated (attribute 60xx, 0100) = 1
- bit position (attribute 60xx, 0102) = 0
- overlay data (attribute 60xx, 3000) = supported (with "bits allocated = 8")

5.1.2.1.3.4 Attribute Description for Waveforms

Waveform Sequence

- Sampling Frequency (attribute 003A,001A) = 2000
- Waveform Bits Allocated (attribute 5400,1004) = 16
- Waveform Bits Stored (attribute 003A,021A) = 16
- Modality (attribute 0008,0060) = “EPS”. This applies to both the Hemodynamic and Electrophysiology applications in Sensis, because of the same sampling rate of 2000 Hz.

5.1.2.1.3.5 Private Information Object Definitions

To fulfill all application requirements, the AXIOM Sensis DICOM implementation will use private IOD’s to store Data currently not defined in the DICOM Standard according the DICOM information model. The privately defined IOD will contain all references to identify the Patient/Study/Series/Instances to which the related information belongs.

Currently this format is used for the proprietary “Event Log”, “Presentation Log objects”, “Ablation Graph” and “Mapping system images”.

All IOD used to store this private Information will be based on various Instances of the SIEMENS Non-Image IOD.

Please see “SIEMENS Private Non-Image IOD" and "Private Non-Image IOD" in the Appendix for a detailed overview of the private IOD definition and the IOD tables for value encoding.

Note: The private Non-Image IODs are necessary for opening and viewing a Sensis study. So it is mandatory that any DICOM node handling the Sensis study also supports these IODs.

5.1.3 Association Acceptance Policy

The AXIOM Sensis XP DICOM application attempts to accept a new association for

- DIMSE C-ECHO
- DIMSE C-STORE

service operations. Any Information Objects transmitted on that association will be checked on conformance and stored in database if check was successful.

5.1.3.1 Associated Real-World Activity - Receive

5.1.3.1.1 Associated Real-World Activity – Receiving Images from a Remote Node

The daemon receiving process will accept an association and will receive any images transmitted on that association and will store the images on disk in the own database if the conformance check is performed successfully.

5.1.3.1.2 Accepted Presentation Context – Receiving Images

The AXIOM Sensis XP DICOM storage provider will only accept MONOCHROMEx encoded images.

Color encoded images (RGB or Palette Color) are not supported.

The AXIOM Sensis XP DICOM application will accept Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
X-Ray **A**ngiographic Image	1.2.840.10008.5.1.4.1.1.12.1	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossless, Process 14 (selection value 1) JPEG Lossy Baseline (Process 1) ***1** JPEG Lossy Extended ***1** (Process 2 & 4) Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.2	SCP	None
Cardiac Electrophysiology Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.3.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
CSA Non-Image Storage	1.3.12.2.1107.5.9.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Verification	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None

Table 10 Proposed Presentation Context – Receiving Images

5.1.3.1.3 SOP-specific Conformance Statement – Receiving Images

The AXIOM Sensis XP DICOM application conforms to the Full Storage Class at Level **2**.

Upon successfully receiving a C-STORE-RQ, the Siemens AXIOM Sensis XP DICOM receiver performs a plausibility test on the received object and checks the availability of system resources. In the event of a successful C-STORE operation, the image object has successfully been written on disk in the Siemens AXIOM Sensis image format. For Private Attributes of VR=SQ only a nesting level of one is supported. This means that Private Sequences containing another Sequence will be removed from the image header during Storage.

The AXIOM Sensis XP DICOM application returns the status SUCCESS upon successful operation, otherwise one of the following status codes is returned and the association is aborted:

- Refused (A700):
  This error status indicates a lack of Resources (e.g. not enough disk space) on the AXIOM Sensis XP modality.
- Invalid Dataset (0xA900 or 0xC000):
  An error occurred while processing the object which makes it impossible to proceed. The object will not be stored and the association is aborted. The dataset may not contain one of the Attributes “Study Instance UID”, “Series Instance UID” or “SOP Instance UID”, or one of them might have an invalid value.
- Processing Error (0110):
  An error occurred while processing the object, which makes it impossible to proceed.

Attention! Only after sending the response, the image will be saved into the database. If during this operation an error occurs, the association will be aborted. This implies that a C-STORE-RSP with status SUCCESS does not mean that the image was successfully stored into the database.

If an image instance is received that is identified by a SOP Instance UID which is already used by an Instance stored in database then the actual received image will be discarded. The existing Instance is not superseded.

5.1.3.1.3.1 Restrictions for Waveforms

In Sensis only Waveforms generated by Sensis can be displayed and only if the corresponding NonImage objects are present in the same study.

The maximum size for Waveform objects is 600 MB in order to make them fit one CD for export and long term storage.

5.1.3.1.4 Presentation Context Acceptance Criterion

The AXIOM Sensis XP DICOM application will accept any number of verification or storage SOP classes that are listed above. The number of presentation contexts accepted is limited to the maximum of 127 (DICOM limit). In the event that the AXIOM Sensis XP DICOM application runs out of resources, it will reject the association request.

5.1.3.1.5 Transfer Syntax Selection Policies

The AXIOM Sensis XP DICOM application currently supports

- the Implicit VR Little Endian, the Explicit VR Little Endian and Explicit VR Big Endian Transfer Syntaxes
- the JPEG Lossless Non-hierarchical Transfer Syntax
- the JPEG Baseline and JPEG Extended Transfer Syntaxes (JPEG Lossy).

Any proposed presentation context including one of these Transfer Syntaxes will be accepted. Any proposed presentation context that does not include one of these Transfer Syntaxes will be rejected.

The order of preference in accepting Transfer Syntaxes within Presentation Contexts or Presentation Contexts with single Transfer Syntaxes is:

1. JPEG Lossy Extended
2. JPEG Lossless non-hierarchical
3. JPEG Lossy Baseline
4. Explicit VR Little Endian
5. Explicit VR Big Endian
6. Implicit VR Little Endian

With Implicit VR Little Endian Transfer Syntax the AXIOM Sensis XP DICOM application will remove any Private Attributes not known to the application. Decision on removal of a Private Element is done if there is NO entry in the attribute-dictionary of the AXIOM Sensis XP DICOM application.

Therefore any Explicit VR Transfer Syntax shall preferably be used by the Storage SCUs when sending Composite Image Instances to the AXIOM Sensis XP DICOM application.

6 Implementation Model Storage Commitment

The Storage Commitment service class defines an application-level class of service which facilitates the commitment to storage. It performs an additional task of commitment of composite objects apart from the network based storage of images as defined by the Storage Service class. The AXIOM Sensis XP DICOM implementation supports the Storage Commitment Push Model as SCU.

6.1 Application Data Flow Diagram

The AXIOM Sensis XP DICOM network implementation acts as SCU for the Storage Commitment Push Model Service using the Storage Commitment Service Class. The product target Operating System is Microsoft Windows XP.

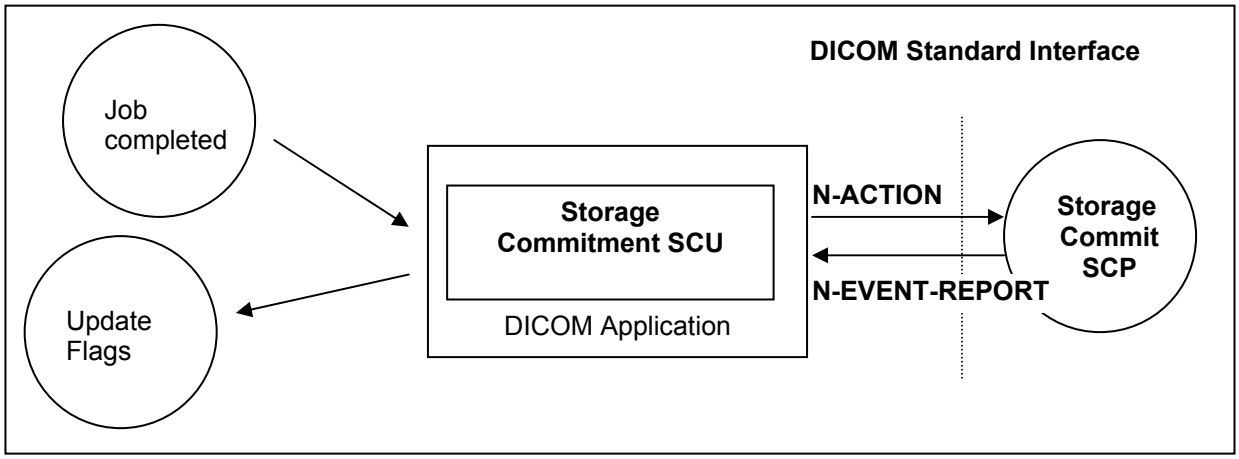

Figure 3 Application Data Flow Diagram – Storage Commitment SCU

6.2 Functional Definitions of Application Entities

With each successfully completed send job, the AXIOM Sensis XP DICOM Application will create a Storage Commitment Push Model Identifier from the SOP Instances sent. Then a Storage Commit Request is triggered. Depending on configuration, the AXIOM Sensis XP DICOM application will keep the association open for responses with a configurable time-out, or closes the association and expects responses on a different association that has to be establishes by the remote Storage Commitment SCP.

The commitment status derived from the related trigger response will be indicated in the related Status Flags of the related entity. It is possible to create triggers (“auto rules”) from this event.

The Transaction UIDs of the pending commitment request are kept “open” for a configurable amount in time (default: 1h). If the “open time” for a pending commitment request has elapsed w/o a related response from the provider, the Transaction UID is removed and the related entities are indicated as “commit failed”.

In any case, commitment will only be requested for previously and successfully sent images.

6.3 Sequencing of real World Activities

The Storage Commitment trigger is automatically derived from the successful completion of a Send Job.

7 AE Specification Storage Commitment

7.1 Storage Commitment AE Specification

SIEMENS AXIOM Sensis XP DICOM application provides Standard Conformance to the following DICOMV3.0 SOP Class as an SCU:

SOP Class Name	SOP Class UID
Storage Commitment Push Model	1.2.840.10008.1.20.1

Table 11 Storage Commitment SOP Class supported

7.1.1 Association Establishment Policies

7.1.1.1 General

With a Send Job successfully completed, the DICOM application will generate a Storage Commitment Identifier which references to all Instances of the processed job. The Commit Request is then sent over a single opened association. The AXIOM Sensis XP will wait for Status responses of the Storage Commitment Request. If the Provider accepts the Storage Commitment with Success Status, the generated Transaction UID, together with study identification data and a time-stamp, is kept. Depending on configuration, the association is closed when the configured time-out has elapsed or a response was received before. If the association is closed before a response was received, the response is then expected on a different association. Multiple Storage Commitment Requests can be pending.

The default PDU size used will be 256 KB.

7.1.1.2 Number of Associations

The AXIOM Sensis XP DICOM application initiates several associations at a time, one for each destination to which a transfer request is being processed in the active job queue list.

The AXIOM Sensis XP DICOM application is able to accept multiple associations at a time. It can handle up to 10 associations in parallel.

7.1.1.3 Asynchronous Nature

The AXIOM Sensis XP DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

7.1.1.4 Implementation Identifying Information

Implementation Class UID	1.3.12.2.1107.5.9.20000101
Implementation Version Name	SIEMENS_SWFVE31F

Table 12 Implementation Identifying Information

7.1.2 Association Initiation Policy

The AXIOM Sensis XP DICOM Application Entity acts as a Service Class User (SCU) for the

- Storage Commitment Push Model Service Class (to request commitment for storage of instances previously sent).

To do so, the AXIOM Sensis XP will issue a

- N-ACTION DIMSE to request commitment

7.1.2.1 Real World Activity – Storage Commitment

7.1.2.1.1 Associated Real-World Activity - Job Completed

The AXIOM Sensis XP Storage Commitment application sends the commit request (N-ACTION-RQ) message and waits for acceptance of this request (N-ACTION-RSP). After receiving this, the transaction is marked as “waiting”.

Depending on a configuration value, the association will then be closed or kept open. In the first case, there is another configurable timeout giving the number of hours (h) and minutes (m) (by default 1h:0m) to wait for the corresponding commit response (N-EVENT-REPORT). In the second case, this time is the (also configurable) time-out for the association. For both cases, if the commit response (N-EVENT-REPORT) does not arrive during the configured time, the transaction will be marked as failed. The AXIOM Sensis XP does not resend objects from a failed Storage Commitment result in any case.

If the commit response (N-EVENT-REPORT) received has the status of “complete - failure exists”, the transaction is marked as failed, else the transaction is marked as “completed”; In both cases, a message is shown to the user.

7.1.2.1.2 Proposed Presentation Contexts - Job Completed

The AXIOM Sensis XP DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

Table 13 Proposed Presentation contents – request Storage Commitment

7.1.2.1.3 SOP Specific Conformance Statement- Job Completed

Storage Commitment is supported for all the SOP class UIDs mentioned in Chapter 5.1.3.1.2.

The Referenced Study Component Sequence is not supported.

Storage Media File-Set ID and UID Attributes will not be supported in the commitment request (N-ACTION primitive) invoked by the Storage Commitment SCU.

7.1.2.1.4 Associated Real-World Activity - Update Flags

The AXIOM Sensis XP Storage Commitment DICOM Application has sent a Storage Commitment Request and, being configured to receive response on a separate association, has closed the association, and now it gets an association request from the Storage Commitment SCP that want to send the results. The AXIOM Sensis XP DICOM application will await Storage commitment Notification triggers. Any incoming Notification will be checked for validity, that is, if the related Transaction UID is still part of the Pending Request Queue.

If the Notification is valid, the Notification Event Information is evaluated and the related Instances marked with the related status. The over-all Commit Status of the higher Information Entities is derived from propagation of the States of all Image entities included in a study.

The Status Flags directly affected by Storage Commitment results and indicated in the different entities of the Patient Browser list can be one of

- "AC" or "SC" - Successful Commitment, A means archived to configured Archive destination, whereas S means sent to any other destination
- "Af" of "Sf" - Commitment failed.
- "A?" or "S?" - Commitment request is sent, response is pending.

In case of failure the user has to repeat the transfer of images to the Archive destination. Another Storage Commitment will be performed after sending is completed successfully.

7.1.2.1.5 Accepted Presentation Contexts - Update Flags

The Siemens AXIOM Sensis XP DICOM application will accept Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

Table 14 Accepted Presentation contents – request Storage Commitment

7.1.2.1.6 SOP-specific Conformance Statement - Update Flags

If the Commitment response (N-EVENT-REPORT) received has the status of "complete - failure exists", the transaction is marked as failed, else the transaction is marked as "completed"; In both cases, a message is shown to the user.

The related status flags are set for the committed images in the local database.

The AXIOM Sensis XP DICOM application will NOT support the Storage Media File Set ID attributes.

8 Implementation Model Query / Retrieve

The query/retrieve service class defines an application-level class of services which facilitates the management of images and patient data against the well-defined information model of DICOM and allows a DICOM AE to retrieve images from a remote DICOM node or to request a remote DICOM AE to initiate a transfer of images to another DICOM AE. The AXIOM Sensis XP DICOM query/retrieve application supports the query/retrieve services to act as SCU and SCP.

8.1 Application Data Flow Diagram

The AXIOM Sensis XP DICOM network implementation acts as SCU and SCP for the query/retrieve network service. The product target Operating System is Microsoft Windows XP.

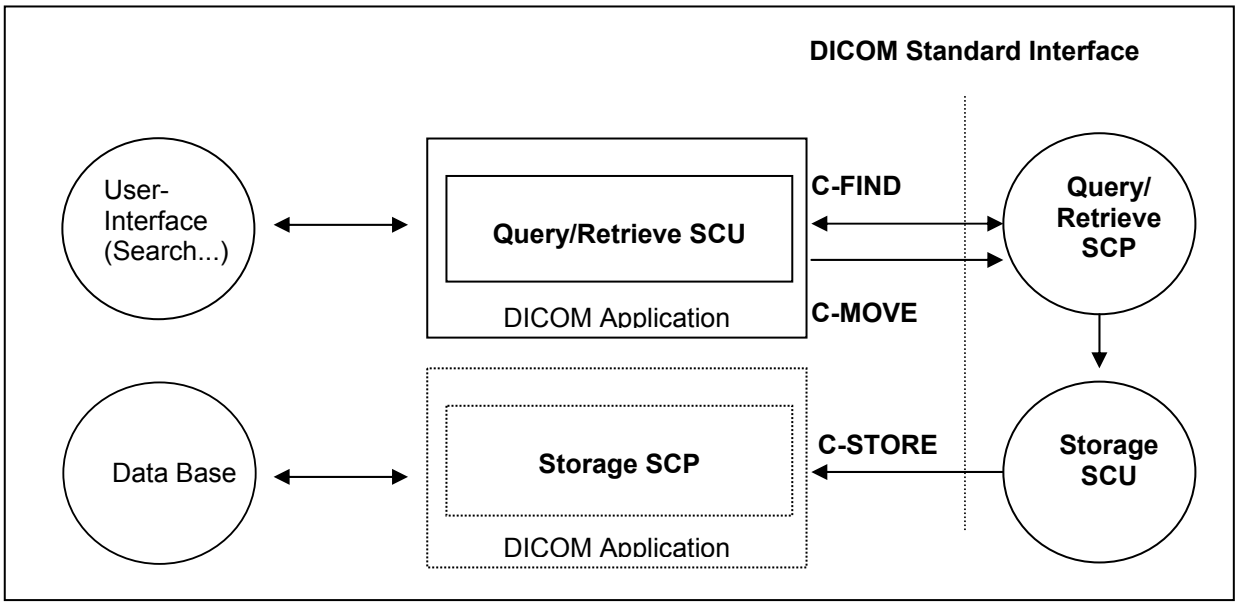

Figure 4 AXIOM Sensis XP Application Data Flow Diagram – Query/Retrieve SCU

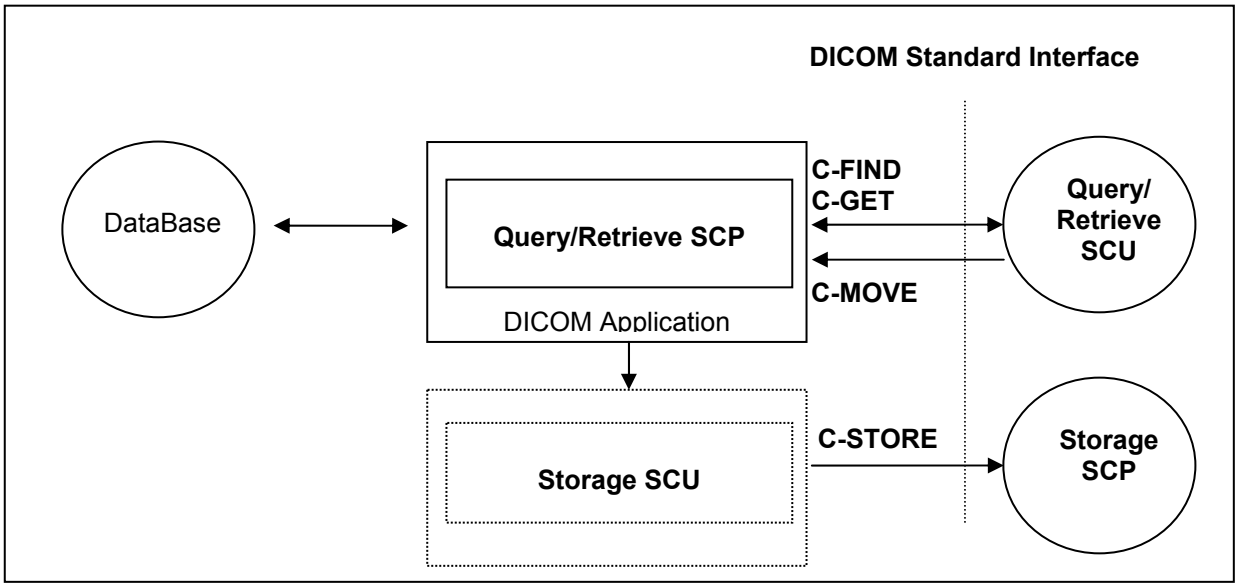

Figure 5 AXIOM Sensis XP Application Data Flow Diagram – Query/Retrieve SCP

8.2 Functional Definitions of Application Entities

The AXIOM Sensis XP DICOM Query/Retrieve SCU requests the remote query/retrieve SCP to perform a search and match to the keys specified in the request in order to display the results in the AXIOM Sensis XP user interface. Depending on user action (Import) the AXIOM Sensis XP DICOM SCU sends a C-MOVE DIMSE service to initiate a C-STORE sub-operation on the SCP to start an image transfer from remote Storage SCU (running on Query/Retrieve SCP) to the AXIOM Sensis XP Storage SCP.

The AXIOM Sensis XP DICOM query/retrieve SCP responds to C-FIND DIMSE services from remote SCU applications. Depending on further remote request, a C-GET or a C-MOVE involves the AXIOM Sensis XP DICOM query/retrieve SCP application to initiate a C-STORE association (by triggering the own Storage SCU) to send image objects to a remote Storage SCP.

All components of the DICOM query/retrieve SCP application are operating as background server processes. They are running when the machine is powered on and respond to queries based on the records stored in the database.

8.3 Sequencing of Real-World Activities

Retrieve of images is only possible if results from a previous “Search...” operation are available and those entities can be selected for “Import”.

9 Application Entity Specification Query/Retrieve

9.1 Query/Retrieve Service AEs Specification

The Query/Retrieve SCU requests that the remote SCP performs a match of all keys specified in the request, against the information in its database and the identified images will be moved over a different (C-MOVE) storage association.

The Query/Retrieve SCP responds to queries based on the records based on its database and images will be sent to the requesting SCU or to a different storage destination.

SIEMENS AXIOM Sensis XP DICOM products provide Standard Conformance to the following DICOM V3.0 SOP Classes as SCU:

SOP Class Name	SOP Class UID
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2

Table 15 Supported SOP Classes as SCU

SIEMENS AXIOM Sensis XP DICOM products provide Standard Conformance to the following DICOM V3.0 SOP Classes as an SCP:

SOP Class Name	SOP Class UID
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Patient Root Query/Retrieve Information Model - GET	1.2.840.10008.5.1.4.1.2.1.3
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
Study Root Query/Retrieve Information Model - GET	1.2.840.10008.5.1.4.1.2.2.3
Patient/Study Only Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.3.1
Patient/Study Only Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2
Patient/Study Only Query/Retrieve Information Model - GET	1.2.840.10008.5.1.4.1.2.3.3

Table 16 Supported SOP Classes as SCP

Note: See also the Storage DICOM Conformance Statement of the AXIOM Sensis XP DICOM application to compare for conformance of the C-STORE sub-operation generated by the C-GET or C-MOVE DIMSE services. Furthermore compare the supported Storage Service SOP classes described in the Storage DICOM Conformance Statement of the Modality to which the images shall be transferred to.

9.1.1 Association Establishment Policies

9.1.1.1 General

With the “Search...” function the query data are input and the DICOM query/retrieve application is started. A query request will be sent out to one remote node that can be selected from a list of configured Query Providers and the response data will be displayed for the user. Upon request (Import), the retrieval of selected items is initiated.

The default PDU size used will be 256 KB.

9.1.1.2 Number of Associations

The AXIOM Sensis XP DICOM application initiates one association for each query request being processed to a remote node. The maximum number of active associations is configurable.

The AXIOM Sensis XP DICOM application is able to accept multiple associations at a time. It can handle up to 10 associations in parallel.

9.1.1.3 Asynchronous Nature

The AXIOM Sensis XP DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

9.1.1.4 Implementation Identifying Information

Implementation Class UID	1.3.12.2.1107.5.9.20000101
Implementation Version Name	SIEMENS_SWFVE31F

Table 17 Implementation Identifying Information

9.1.2 Association Initiation Policy

The query user interface will request the query-data from the user and triggers one C-FIND request to the selected remote node. The response data will be displayed in the query UI for further data navigation.

When requesting Import of related items the browser requests the retrieve application to send a C-MOVE request to the related remote node. Images will then be received by the Storage SCP as described in the related section.

The query/retrieve operation can be canceled at any time by a respective C-FIND-CANCEL or C-MOVE-CANCEL.

9.1.2.1 Real World Activity - Find SCU

9.1.2.1.1 Associated Real-World Activity - Find SCU “Search”

The associated Real-World activity is to fill out a query form with search data and pass it as query to the network application which issues a C-FIND over a previously built association. The remote SCP will respond with related data-entries that will be passed to a browser application. When data transfer is finished the association is closed.

9.1.2.1.2 Proposed Presentation Contexts - Find SCU

The AXIOM Sensis XP DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Patient Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Study Root Query/Retrieve Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

Table 18 Proposed Presentation Contexts - Find SCU

It is configurable which of the two query models (or both) are to be used by the AXIOM Sensis XP DICOM Query SCU application. If both Abstract Syntaxes are configured, The C-FIND SCU will use the Patient Root Model only for C-FIND requests on PATIENT level. For all other levels it will use the STUDY root model.

9.1.2.1.3 Conformance Statement - Find SCU

The AXIOM Sensis XP DICOM Query/Retrieve SCU supports hierarchical queries with all mandatory search keys. The interactive querying of attributes on IMAGE level is supported by the Query SCU, hence but no search criteria can be entered. So image level is always queried with a fixed list of "universal(Null)" values.

The following table describes the search keys for the different query models that the SCU supports. Matching is either wildcard, which means that the user can supply a string containing wildcards, or universal, which means that the attribute is requested as return value.

Attribute name	Tag	Type	Matching	User input	return value display
Patient Level [a]					
Patient Name	(0010,0010)	R	Wildcard[b]	enter value	yes
Patient ID	(0010,0020)	U	Wildcard	enter value	yes
Patient's Birth date	(0010,0030)	O	universal (Null)	enter value	yes
Patient's Sex	(0010,0040)	O	universal (Null)	enter value	yes
Number of Patient related Studies	(0020,1200)	O	universal (Null)	-	yes[b]
Number of Patient related Series	(0020,1202)	O	universal (Null)	-	no
Number of Patient related Instances	(0020,1204)	O	universal (Null)	-	no
Study Level					

a Patient Root Information Model only
b Always a "*" is appended to the user-supplied string
c Implicitly visualized in the UI if no study and series search attributes have been entered
d Study Root model only

Attribute name	Tag	Type	Matching	User input	return value display
Patient Name [d]	(0010,0010)	R	Wildcard[b]	enter value	yes
Patient ID	(0010,0020)	R	Wildcard[b]	enter value	yes
Patient's Birth date [d]	(0010,0030)	O	universal (Null)	enter value	yes
Patient's Sex [d]	(0010,0040)	O	universal (Null)	enter value	yes
Study Instance UID	(0020,000D)	U	single value	-	yes
Study ID	(0020,0010)	R	universal (Null)	enter value	yes
Study Date	(0008,0020)	R	universal (Null)	enter value	yes
Study Time	(0008,0030)	R	universal (Null)	-	yes
Accession Number	(0008,0050)	R	universal (Null)	-	yes
Study Description	(0008,1030)	O	universal (Null)	-	yes
Referring Physician's Name	(0008,0090)	O	universal (Null)	-	yes
Name of Physician Reading Study	(0008,1060)	O	universal (Null)	-	yes
Modalities in Study	(0008,0061)	O	universal (Null)	-	yes
Storage Media File-Set ID	(0008,0130)	O	universal (Null)	-	no
Retrieve AE Title	(0008,0054)	O	universal (Null)	-	no
Number of Study related Series	(0020,1206)	O	universal (Null)	-	yes
Number of Study related Instances	(0020,1208)	O	universal (Null)	-	no
Series Level					
Series Instance UID	(0020,000E)	U	single value	-	yes
Series Number	(0020,0011)	R	universal (Null)	-	yes
Modality	(0008,0060)	R	universal (Null)	enter value	yes
Series Date	(0008,0021)	O	universal (Null)	-	yes
Series Time	(0008,0031)	O	universal (Null)	-	yes
Series Description	(0008,103E)	O	universal (Null)	enter value	yes
Body Part Examined	(0018,0015)	O	universal (Null)	enter value	yes
Performing Physician	(0008,1050)	O	universal (Null)	enter value	yes
Storage Media File-Set ID	(0008,0130)	O	universal (Null)	-	yes
Retrieve AE Title	(0008,0054)	O	universal (Null)	-	yes
Protocol Name	(0018,1030)	O	universal (Null)	-	no
Perf. Procedure Step Start Date	(0040,0244)	O	universal (Null)	-	yes
Perf. Procedure Step Start Time	(0040,0245)	O	universal (Null)	-	yes
Requested Attribute Sequence	(0040,0275)	O	universal (Null)	-	yes
> Requested Procedure ID	(0040,1001)	O	universal (Null)	-	yes

Attribute name	Tag	Type	Matching	User input	return value display
> Scheduled Procedure ID	(0040,0009)	O	universal (Null)	-	yes
Number of Series related Instances	(0020,1209)	O	universal (Null)	-	yes
Instance Level					
SOP Instance UID	(0008,0018)	U	single value	-	no
Instance Number	(0020,0013)	R	universal (Null)	-	yes
Storage Media File-Set ID	(0008,0130)	O	universal (Null)	-	no
Retrieve AE Title	(0008,0054)	O	universal (Null)	-	no
Instance Date	(0008,0023)	O	universal (Null)	-	no
Instance Time	(0008,0033)	O	universal (Null)	-	no
Number of Frames	(0028,0008)	O	universal (Null)	-	yes
Image Comments	(0020,4000)	O	universal (Null)	-	no

Table 19 Search keys for Query models - Find SCU

The Find SCU interprets following status codes:

Service Status	Meaning	Protocol Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

Table 20 C-FIND response status

9.1.2.2 Real-World Activity – Move SCU

9.1.2.2.1 Associated Real-World Activity – Move SCU "Import"

When selecting a data entry in the Query UI and activate the "Import" function, a retrieval request is passed to the archival application which issues a C-MOVE service according to the Patient Root or Study Root query model. (The Storage Service Class Conformance Statement describes the C-STORE service, which is generated by processing the C-MOVE service.)

The transferred object data are processed as described in the storage class SCP descriptions.

The possibility to request the remote C-MOVE provider (remote application that responded to the C-FIND) to move data to an application entity other than the C-MOVE SCU (the AXIOM Sensis XP DICOM application) is NOT USED.

C-MOVE operation on Patient Level is not supported by the Query UI.

9.1.2.2.2 Proposed Presentation Contexts - Move SCU "Import"

The AXIOM Sensis XP DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Patient Root Query/Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Study Root Query/Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

Table 21 Proposed Presentation Contexts - Move SCU "Import"

Note: C-MOVE extended negotiation will not be supported by the SCU

9.1.2.2.3 SOP Specific Conformance Statement - Move SCU "Import"

At association establishment time the C-MOVE presentation context shall be negotiated. The C-STORE sub-operations must be done on a different association to transfer images to the own Storage Service Class SCP.

The Move SCU interprets following status codes:

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform sub operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	CXXX	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Sub-operations Complete - One or more Failures or Warnings	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warning	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

Table 22 Status Codes - Move SCU "Import"

9.1.3 Association Acceptance Policy

The AXIOM Sensis XP DICOM application will accept associations for the following DIMSE-C operations as SCP:

- C-FIND
- C-GET
- C-MOVE
- C-FIND-CANCEL
- C-GET-CANCEL
- C-MOVE-CANCEL

Extended negotiation - which is relational retrieve - is NOT supported for the above listed services. The AXIOM Sensis DICOM application does support multiple C-FIND requests over the same association, while multiple C-MOVE or C-GET operations are not supported over the same association.

9.1.3.1 Real-World Activity - Find SCP

9.1.3.1.1 Associated Real-World Activity - Find SCP

The associated Real-World activity is to respond query requests to an SCU with the query model Patient Root, Study Root and Patient/Study Only. Relational retrieve operation is NOT supported. With a C-FIND-CANCEL request the running query can be canceled at any time.

Multiple C-FIND requests over the same association are supported.

9.1.3.1.2 Accepted Presentation Contexts - Find SCP

The AXIOM Sensis XP DICOM application will accept Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Patient Root Query/Retrieve Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Study Root Query/Retrieve Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Patient/Study Only Query/Retrieve Model – FIND	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

Table 23 Accepted Presentation Contexts - Find SCP

Note: C-FIND Extended Negotiation will NOT be supported.
The order of preference for accepting Transfer Syntaxes is: 1. Explicit VR Little Endian, 2. Explicit VR Big Endian, 3. Implicit VR Little Endian

9.1.3.1.3 SOP Specific Conformance Statement - Find SCP

The AXIOM Sensis XP DICOM Query/Retrieve SCP supports hierarchical queries with all mandatory and optional search keys.

The query attribute contents will be treated case-sensitive.

With wildcard queries the symbol "?" is treated as "*" by the C-FIND SCP application. As a consequence the query string of "?abc*" will be processed as "*abc*".

If the value for the patient-level unique key "Patient ID" is not known, it may be returned with zero length. The attribute "Image Comments" will not be included in the C-FIND-RSP, if it is not set in the DB, even if it was requested as return key in the related C-FIND-RQ.

Usage of Storage Media File-Set ID, Retrieve AE Title with C-FIND-RSP message:

- The Storage Media File-Set ID - if existent - can be returned at Study/Series/Image Level. Only on Image Level, the values of ONLINE, NEARLINE of OFFLINE are returned to indicate the Storage Location of the related Instance.
- The Retrieve AE Title - if existent - can only be returned at Image Level (for Patient Root and Study Root models) or Study Level (for Patient/Study Only model).

Relational Queries are **not** supported.

A remote DICOM AE can cancel the running query by sending a C-FIND-CANCEL. Matches are possibly continuing (more C-FIND response with status PENDING) until the cancel operation has completed.

The supported attributes on the various query levels of the three supported information models are list in the tables of the following sections.

9.1.3.1.3.1 Patient Root Information Model

Attribute Name	Tag	Usage SCU	Matching
Patient Level			
Patient Name	(0010,0010)	R	single value, wildcard, universal
Patient ID	(0010,0020)	U	single value, wildcard, universal
Patient's Birth Date	(0010,0030)	O	single value, range, universal
Patient's Birth Time	(0010,0032)	O	single value, range, universal
Patient's Sex	(0010,0040)	O	single value, wildcard, universal
Ethnic Group	(0010,2160)	O	single value, wildcard, universal
Patient Comments	(0010,4000)	O	wildcard, universal
Number of Patient related Studies	(0020,1200)	O	universal
Number of Patient related Series	(0020,1202)	O	universal
Number of Patient related Instances	(0020,1204)	O	universal
Study Level			
Study Instance UID	(0020,000D)	U	single value, list of UIDs
Study ID	(0020,0010)	R	single value, wildcard, universal
Study Date	(0008,0020)	R	single value, range, universal
Study Time	(0008,0030)	R	single value, range, universal
Accession Number	(0008,0050)	R	single value, wildcard, universal
Referring Physician's Name	(0008,0090)	O	single value, wildcard, universal

Attribute Name	Tag	Usage SCU	Matching
Study Description	(0008,1030)	O	single value, wildcard, universal
Admitting Diagnoses Description	(0008,1080)	O	single value, wildcard, universal
Patient's Age	(0010,1010)	O	single value, wildcard, universal
Patient's Size	(0010,1020)	O	single value, universal
Patient's Weight	(0010,1030)	O	single value, universal
Occupation	(0010,2180)	O	single value, wildcard, universal
Additional Patient History	(0010,21B0)	O	wildcard, universal
Name of Physician reading Study	(0008,1060)	O	single value, wildcard, universal
Modalities in Study	(0008,0061)	O	multiple values, universal
Number of Study related Series	(0020,1206)	O	universal
Number of Study related Instances	(0020,1208)	O	universal
Series Level			
Series Instance UID	(0020,000E)	U	single value, list of UID
Series Number	(0020,0011)	R	single value, universal
Modality	(0008,0060)	R	single value, wildcard, universal
Laterality	(0020,0060)	O	single value, wildcard, universal
Body Part Examined	(0018,0015)	O	single value, wildcard, universal
Patient Position	(0018,5100)	O	single value, wildcard, universal
Smallest Pixel Value in Series	(0028,0108)	O	single value, universal
Largest Pixel Value in Series	(0028,0109)	O	single value, universal
Protocol Name	(0018,1030)	O	single value, wildcard, universal
Series Date	(0008,0021)	O	single value, range, universal
Series Time	(0008,0031)	O	single value, range, universal
Series Description	(0008,103E)	O	single value, wildcard, universal
Operators Name	(0008,1070)	O	single value, wildcard, universal
Performing Physician's Name	(0008,1050)	O	single value, wildcard, universal
Perf. Procedure Step Start Date	(0040,0244)	O	universal
Perf. Procedure Step Start Time	(0040,0245)	O	universal
Number of Series related Instances	(0020,1209)	O	universal
Instance Level			
SOP Instance UID	(0008,0018)	U	single value, list of UID
Image Number	(0020,0013)	R	single value, universal
Image Date	(0008,0023)	O	single value, range, universal
Image Time	(0008,0033)	O	single value, range, universal
Modality	(0008,0060)	O	single value, wildcard, universal
Image Comments	(0020,4000)	O	Universal

Table 24 Supported Query attributes sorted by Query Level – Patient Root Information Model

9.1.3.1.3.2 Study Root Information Model

Attribute Name	Tag	Usage SCU	Matching
Study Level			
Patient Name	(0010,0010)	R	Single value, Wildcard, universal
Patient ID	(0010,0020)	R	Single Value, Wildcard, universal
Patient's Birth Date	(0010,0030)	O	Single Value, Range, universal
Patient's Birth Time	(0010,0032)	O	Single Value, Range, universal
Patient's Sex	(0010,0040)	O	Single Value, Wildcard, universal
Patient Comments	(0010,4000)	O	Wildcard, universal
Number of Patient related Studies	(0020,1200)	O	universal
Number of Patient related Series	(0020,1202)	O	universal
Number of Patient related Instances	(0020,1204)	O	universal
Study Instance UID	(0020,000D)	U	Single Value, List of UIDs
Study ID	(0020,0010)	R	Single Value, Wildcard, universal
Study Date	(0008,0020)	R	Single Value, Range, universal
Study Time	(0008,0030)	R	Single Value, Range, universal
Accession Number	(0008,0050)	R	Single Value, Wildcard, universal
Referring Physician's Name	(0008,0090)	O	Single Value, Wildcard, universal
Study Description	(0008,1030)	O	Single Value, Wildcard, universal
Admitting Diagnosis Description	(0008,1080)	O	Single Value, Wildcard, universal
Patient's Age	(0010,1010)	O	Single Value, Wildcard, universal
Patient's Size	(0010,1020)	O	Single Value, universal
Patient's Weight	(0010,1030)	O	Single Value, universal
Occupation	(0010,2180)	O	Single Value, Wildcard, universal
Additional Patient History	(0010,21B0)	O	Wildcard, universal
Name of Physician reading the Study	(0008,1060)	O	Single Value, Wildcard, universal
Modalities in Study	(0008,0061)	O	Multiple values, universal
Number of Study Related Series	(0020,1206)	O	universal
Number of Study Related Instances	(0020,1208)	O	universal
Series Level			
Series Instance UID	(0020,000E)	U	Single Value, List of UIDs
Series Number	(0020,0011)	R	Single Value, universal
Modality	(0008,0060)	R	Single Value, Wildcard, universal
Laterality	(0020,0060)	O	Single Value, Wildcard, universal
Body Part Examined	(0018,0015)	O	Single Value, Wildcard, universal
Patient Position	(0018,5100)	O	Single Value, Wildcard, universal
Smallest Pixel Value in Series	(0028,0108)	O	Single Value, universal
Largest Pixel Value in Series	(0028,0109)	O	Single Value, universal
Protocol Name	(0018,1030)	O	Single Value, Wildcard, universal
Series Date	(0008,0021)	O	Single Value, Range, universal
Series Time	(0008,0031)	O	Single Value, Range, universal
Series Description	(0008,103E)	O	Single Value, Wildcard, universal
Operator's Name	(0008,1070)	O	Single Value, Wildcard, universal
Performing Physician's Name	(0008,1050)	O	Single Value, Wildcard, universal
Performed Procedure Step Start Date	(0040,0244)	O	universal
Performed Procedure Step Start Time	(0040,0245)	O	universal
Number of Series related Instances	(0020,1209)	O	universal
Instance Level			
SOP Instance UID	(0008,0018)	U	Single Value, List of UIDs
Image Number	(0020,0013)	R	Single Value, universal
Image Date	(0008,0023)	O	Single Value, Range, universal
Image Time	(0008,0033)	O	Single Value, Range, universal
Modality	(0008,0060)	O	Single Value, Wildcard, universal

Attribute Name	Tag	Usage SCU	Matching
Image Comments	(0020,4000)	O	universal

Table 25 Supported Query attributes sorted by Query Level – Study Root Information Model

9.1.3.1.3.3 Patient/Study Only Information Model

Attribute Name	Tag	Usage SCU	Matching
Patient Level			
Patient Name	(0010,0010)	R	Single value, Wildcard, universal
Patient ID	(0010,0020)	U	Single Value, Wildcard, universal
Patient's Birth Date	(0010,0030)	O	Single Value, Range, universal
Patient's Birth Time	(0010,0032)	O	Single Value, Range, universal
Patient's Sex	(0010,0040)	O	Single Value, Wildcard, universal
Ethnic Group	(0010,2160)	O	Single Value, Wildcard, universal
Patient Comments	(0010,4000)	O	Wildcard, universal
Number of Patient related Studies	(0020,1200)	O	universal
Number of Patient related Series	(0020,1202)	O	universal
Number of Patient related Instances	(0020,1204)	O	universal
Study Level			
Study Instance UID	(0020,000D)	U	Single Value, List of UIDs
Study ID	(0020,0010)	R	Single Value, Wildcard, universal
Study Date	(0008,0020)	R	Single Value, Range, universal
Study Time	(0008,0030)	R	Single Value, Range, universal
Accession Number	(0008,0050)	R	Single Value, Wildcard, universal
Referring Physician's Name	(0008,0090)	O	Single Value, Wildcard, universal
Study Description	(0008,1030)	O	Single Value, Wildcard, universal
Admitting Diagnosis Description	(0008,1080)	O	Single Value, Wildcard, universal
Patient's Age	(0010,1010)	O	Single Value, Wildcard, universal
Patient's Size	(0010,1020)	O	Single Value, universal
Patient's Weight	(0010,1030)	O	Single Value, universal
Occupation	(0010,2180)	O	Single Value, Wildcard, universal
Additional Patient History	(0010,21B0)	O	Wildcard, universal
Name of Physician reading the Study	(0008,1060)	O	Single Value, Wildcard, universal
Modalities in Study	(0008,0061)	O	Multiple values, universal
Number of Study Related Series	(0020,1206)	O	universal
Number of Study Related Instances	(0020,1208)	O	universal

Table 26 Supported Query attributes sorted by Query Level – Patient/Study only Information Model

The Find SCP returns following status codes:

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	C001	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

Table 27 Status Codes

9.1.3.2 Real-World Activity - Get SCP

9.1.3.2.1 Associated Real-World Activity - Get SCP

The associated Real-World activity is to respond to retrieve requests initiated from a foreign SCU. The SCP supports the query model Patient Root, Study Root and Patient/Study Only. The Storage Service Class Conformance Statement describes the C-STORE service, which is generated by the C-GET service. Relational retrieve operation is NOT supported.

Multiple C-GET requests over the same association are NOT supported.

9.1.3.2.2 Accepted Presentation Contexts - Get SCP

The AXIOM Sensis XP DICOM application will accept Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Patient Root Query/Retrieve Model – GET	1.2.840.10008.5.1.4.1.2.1.3	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Study Root Query/Retrieve Model – GET	1.2.840.10008.5.1.4.1.2.2.3	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Patient/Study Only Query/Retrieve Model – GET	1.2.840.10008.5.1.4.1.2.3.3	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

Table 28 Accepted Presentation Contexts - Get SCP

Note: C-GET Extended negotiation will NOT be supported.
The order of preference for accepting Transfer Syntaxes is: 1. Explicit VR Little Endian, 2. Explicit VR Big Endian, 3. Implicit VR Little Endian.

9.1.3.2.3 SOP Specific Conformance Statement - Get SCP

At association establishment time the C-GET presentation context must be negotiated along with the C-STORE sub-operations which must be accomplished on the same association as the C-GET operation. Relational retrieve operation is NOT supported.

The Get SCP returns following status codes:

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform sub operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	C001	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Sub-operations Complete - One or more Failures of	B000	(0000,1020)

Service Status	Meaning	Error Codes	Related Fields
	Warnings		(0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warning	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

Table 29 Status Codes

9.1.3.3 Real-World Activity - Move SCP

9.1.3.3.1 Associated Real-World Activity - Move SCP

The associated Real-World activity is to respond to retrieve requests to an SCU. The SCP supports the query model Patient Root, Study Root and Patient/Study Only. The Storage Service Class Conformance Statement describes the C-STORE service, which is generated by the C-MOVE service. Relational retrieve operation is NOT supported.

Multiple C-MOVE requests over the same association are NOT supported.

9.1.3.3.2 Accepted Presentation Contexts - Move SCP

The AXIOM Sensis XP DICOM application will accept Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Patient Root Query/Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Study Root Query/Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Patient/Study Only Query/Retrieve Model – MOVE	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

Table 30 Accepted Presentation Contexts - Move SCP

Note: C-MOVE Extended negotiation will NOT be supported.
The order of preference for accepting Transfer Syntaxes is: 1. Explicit VR Little Endian, 2. Explicit VR Big Endian, 3. Implicit VR Little Endian.

9.1.3.3.3 SOP Specific Conformance Statement - Move SCP

At association establishment time the C-MOVE presentation context shall be negotiated. The C-STORE sub-operations is done on a different association, specified in the C-MOVE request, to transfer images to a remote SCP of the Storage Service Class. Relational retrieve operation is NOT supported.

The Move SCP returns following status codes:

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform sub operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	C001	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Sub-operations Complete - One or more Failures of Warnings	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warning	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

Table 31 Status Codes

10 Implementation Model Worklist

The Basic Worklist Management Service class defines an application-level class of service that facilitates the transfer of worklists from the information system to the imaging modality. The worklist is queried by the AE and supplies the SCU with the scheduled tasks, which have to be performed on the modality. The AXIOM Sensis XP DICOM worklist application supports the worklist service as SCU.

10.1 Application Data Flow Diagram

The AXIOM Sensis XP DICOM network implementation acts as SCU for the Basic Worklist Service using the Modality Worklist SOP Class. The product target Operating System is Microsoft Windows XP.

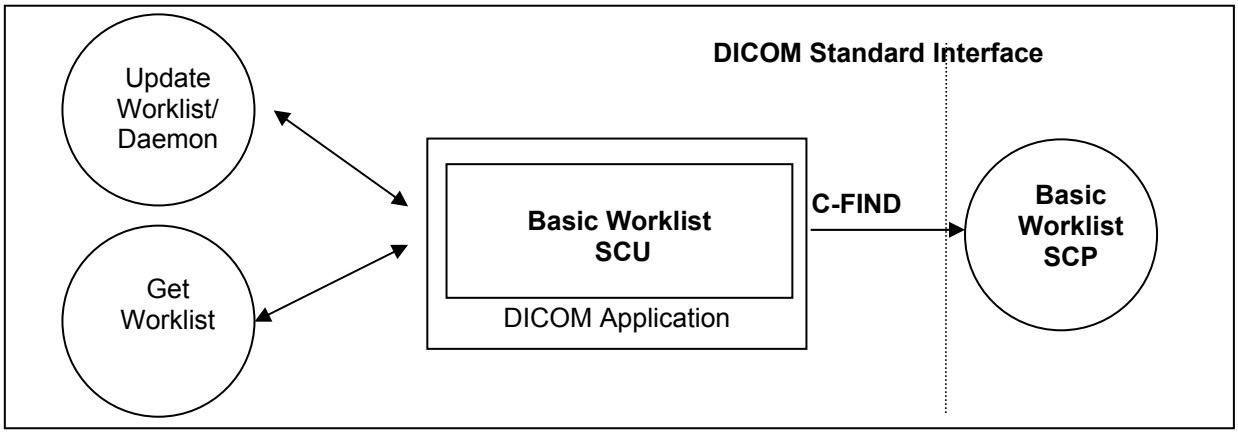

Figure 6 AXIOM Sensis XP Application Flow Diagram – Basic Worklist SCU

10.2 Functional Definitions of Application Entities

The worklist SCU (“broad query”) is invoked from the patient browser user interface or by timer to request the worklist from a remote Information System (Modality Worklist Class SCP). This is done to perform a match to the internal worklist query keys specified in the C-Find DIMSE service issued for the Modality Worklist Model.

The worklist SCP responses to the C-FIND query and scheduled imaging service requests (scheduled procedure steps) and patient demographic information will be downloaded from the information system to the AXIOM Sensis XP modality. All information retrieved will be hold in the scheduling database for usage during Patient registration procedure.

Furthermore, the patient based Query dialog from the patient browser allows entering specific matching criteria ("narrow query") for the worklist query. With the response data the Patient Registration dialog can be populated according availability within the worklist response identifier.

10.3 Sequencing of Real-World Activities

The “narrow” (interactive) Worklist Query requires that sufficient matching keys or a unique matching key are/is entered before the query is issued. Only then a single response can be expected to complete the registration dialog.

11 Application Entity Specification Worklist

11.1 Modality Worklist Service AE Specification

The Modality worklist SCU (patient registration in conjunction with the network application) requests that the remote SCP performs a match of all keys specified in the query against the information in its worklist database.

The AXIOM Sensis XP DICOM network implementation acts as SCU for the Basic Worklist Service using the Modality Worklist SOP Class:

SOP Class Name	SOP Class UID
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31

Table 32 SOP Classes as a SCU

11.1.1 Association Establishment Policies

11.1.1.1 General

It is possible to configure a cyclic update of the modality scheduler database through a background worklist request with date/time and modality information.

In addition, the user can request worklist update with “Update Worklist”. No duplicate entries will be added in the Scheduler DB. Entries are uniquely identified by the Study Instance UID (0020,000D) for the Requested Procedure and the SPS ID (0040,009) in the SPS Sequence (0040,0100).

An interactive worklist query can be issued with search criteria entered in the patient based Query dialog from the patient browser.

The default PDU size used will be 256 KB.

11.1.1.2 Number of Associations

The AXIOM Sensis XP DICOM application initiates one association at a time to query worklist entry data.

11.1.1.3 Asynchronous Nature

The AXIOM Sensis XP DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

11.1.1.4 Implementation Identifying Information

Implementation Class UID	1.3.12.2.1107.5.9.20000101
Implementation Version Name	SIEMENS_SWFVE31F

Table 33 Implementation Identifying Information

11.1.2 Association Initiation Policy

The network application will cyclically query the worklist provider and by request from the patient registration interface. It establishes an association by using the DICOM association services. During association establishment the negotiation of SOP classes to exchange the capabilities of the SCU and the SCP is not supported.

The following DIMSE-C operation is supported as SCU:

- C-FIND

11.1.2.1 Real-World Activity

11.1.2.1.1 Associated Real-World Activity - Query (Update) Worklist

A network application will perform worklist queries with the C-FIND request at regular intervals. In addition it can be triggered by immediate request. The received worklist items will be compared with the contents of the local scheduler database. New items will be inserted into scheduler database.

After each broad-query, all RP/SPS that were canceled or rescheduled to another modality at the RIS will be automatically removed from the Scheduler DB if :

1. the Examination of this procedure has not been started or finished yet, and
2. the corresponding configuration item “Automatic removal of canceled/rescheduled Request” was checked in the Service UI under DICOM/HIS-RIS Node.

No automatic clean-up of the scheduler DB is performed after a Patient base Query since the worklist received does not give the complete list of all currently scheduled procedures for the modality.

11.1.2.1.2 Proposed Presentation Contexts

The AXIOM Sensis XP DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Modality Worklist Information Model- FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

Table 34 Proposed Presentation Contexts

11.1.2.1.3 SOP Specific Conformance Statement

- Search Key Attributes of the Worklist C-FIND

  The AXIOM Sensis XP DICOM worklist SCU supports “broad worklist queries” with all required search keys. The following tables describe the “broad query” search keys that the SCU supports.

Attribute Name	Tag	Matching Key Type	Query Value
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	R	N/A
>Scheduled Station AE Title *(This depends on user configuration (Options->Configuration->Patient Registration) if the "own AET" is provided or not. Use the "HIS/RIS" tab card for configuration.)*	(0040,0001)	R	<own AET> or <zero length>
>Scheduled Procedure Step Start Date *(It depends on user configuration (Options->Configuration->Patient Registration) if the actual Date with a full time range or an interactive input dialog for date/time specification is used.)*	(0040,0002)	R	<act. Date>-<act. Date> or range from UI
>Scheduled Procedure Step Start Time *(It depends on user configuration (Options->Configuration->Patient Registration) if the actual Date with a full time range or an interactive input dialog for date/time specification is used.)*	(0040,0003)	R	00.00-235959.00 or range from UI
>Modality *(This depends on user configuration (Options->Configuration->Patient Registration) if the "own Modality" is provided or not. Use the "HIS/RIS" tab card for configuration.)*	(0008,0060)	R	<zero length> or <own Modality>
>Scheduled Performing Physician	(0040,0006)	R	NULL

Table 35 Supported Broad Worklist Query Search Key Attributes

- Return Key Attributes of the Worklist C-FIND

  The AXIOM Sensis XP DICOM worklist SCU supports worklist queries with return key attributes of all types. The following tables describe the return keys that the SCU supports.

  An “x” in the **UI** column will indicate the attribute is visualized when browsing the Worklist results with Patient Browser and/or during Patient Registration. The Patient Browser display is additionally influenced by the related Browser configuration.

  A tag in the **IOD** column will indicate that the related attribute is included into the SOP Instances of the IODs created during processing of this worklist request.

  A tag in the **MPPS** column will indicate that the related attribute is included into the SOP Instances of the MPPSs created during processing of this worklist request.

  Note: For SIEMENS Word.Report XA image (see Appendix) some Worklist attributes will not be copied.

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
SOP Common					
Specific Character Set	(0008,0005)	1C	-	(0008,0005)	(0008,0005)
Scheduled Procedure Step					
Scheduled Procedure Step Sequence	(0040,0100)	1			
>Modality	(0008,0060)	1	x	(0008,0060)	(0008,0060)
>Requested Contrast Agent	(0032,1070)	2C	x	(0032,1070)	
>Scheduled Station AE Title *(“Scheduled Station AE Title” is taken as default for “Performed Station AE Title”)*	(0040,0001)	1	x		(0040,0241)
>Scheduled Procedure Step Start Date	(0040,0002)	1	x		
>Scheduled Procedure Step Start Time	(0040,0003)	1	x		
>Scheduled Procedure Step End Date	(0040,0004)	3	-		
>Scheduled Procedure Step End Time	(0040,0005)	3	-		

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
>Scheduled Performing Physician's Name *("Scheduled Performing Physician's Name" is taken as default for "Performing Physician's Name")*	(0040,0006)	1	x	(0008,1050)	(0008,1050)
>Scheduled Procedure Step Description *("Scheduled Procedure Step Description" is taken as default for "Performed Procedure Step Description")*	(0040,0007)	1C	x	(0040,0007) (0040,0254)	(0040,0007) (0040,0254)
>Scheduled Protocol Code Sequence *(universal Sequence Match) ("Scheduled Protocol Code Sequence" is taken as default for "Performed Protocol Code Sequence")*	(0040,0008)	1C	-	(0040,0008) (0040,0260)	(0040,0008) (0040,0260)
>>Code Value	(0008,0100)	1C	x		
>>Coding Scheme Designator	(0008,0102)	1C	x		
>>Coding Scheme Version	(0008,0103)	3	x		
>>Code Meaning	(0008,0104)	3	x		
>Scheduled Procedure Step ID *("Scheduled Procedure Step ID" is taken as default for "Performed Procedure Step ID")*	(0040,0009)	1	x	(0040,0009) (0040,0253)	(0040,0009) (0040,0253)
>Scheduled Station Name	(0040,0010)	2	x		
>Scheduled Procedure Step Location *("Scheduled Procedure Step Location" is taken as default for "Performed Location")*	(0040,0011)	2	x		(0040,0242)
>Pre-Medication	(0040,0012)	2C	x		
>Scheduled Procedure Step Status	(0040,0020)	3	x		
>Comments on the Scheduled Procedure Step	(0040,0400)	3	-		
Requested Procedure					
Referenced Study Sequence *(universal Sequence Match)*	(0008,1110)	2	-	(0008,1110)	(0008,1110)
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Study Instance UID	(0020,000D)	1	-	(0020,000D)	(0020,000D)
Requested Procedure Description	(0032,1060)	1C	x	(0032,1060)	(0032,1060)
Requested Procedure Code Sequence *(universal Sequence Match) ("Requested Procedure Code Sequence" is taken as default for "Procedure Code Sequence")*	(0032,1064)	1C	-	(0008,1032) (0032,1064)	(0008,1032)
>Code Value	(0008,0100)	1C	x		
>Coding Scheme Designator	(0008,0102)	1C	x		
>Coding Scheme Version	(0008,0103)	3	x		
>Code Meaning	(0008,0104)	3	x		
Requested Procedure ID *("Requested Procedure ID" is taken as default for "Study ID")*	(0040,1001)	1	x	(0040,1001) (0020,0010)	(0040,1001) (0020,0010)
Reason for the Requested Procedure	(0040,1002)	3	-		
Requested Procedure Priority	(0040,1003)	2	x		
Patient Transport Arrangements	(0040,1004)	2	-		
Requested Procedure Location	(0040,1005)	3	-		
Confidentiality Code	(0040,1008)	3	-		
Reporting Priority	(0040,1009)	3	-		
Names of intended Recipients of Results	(0040,1010)	3	-	(0008,1048)	
Requested Procedure Comments	(0040,1400)	3	x		
Imaging Service Request					
Accession Number	(0008,0050)	2	x	(0008,0050)	(0008,0050)
Referring Physician's Name	(0008,0090)	2	x	(0008,0090)	
Requesting Physician	(0032,1032)	2	x	(0032,1032)	(0032,1032)
Requesting Service	(0032,1033)	3	x	(0032,1033)	
Reason for the Imaging Service Request	(0040,2001)	3	-		
Issuing Date of Imaging Service Request	(0040,2004)	3	-		
Issuing Time of Imaging Service Request	(0040,2005)	3	-		

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
Placer Order Number / Imaging Service Request *(Old tag (0040,2006) is retired and not used.)*	(0040,2016)	3	-		(0040,2016)
Filler Order Number / Imaging Service Request *(Old tag (0040,2007) is retired and not used.)*	(0040,2017)	3	-		(0040,2017)
Order entered by …	(0040,2008)	3	-		
Order Enterer's location	(0040,2009)	3	-		
Order Callback Phone Number	(0040,2010)	3	-		
Imaging Service Request Comments	(0040,2400)	3	x		
Visit Identification					
Institution Name	(0008,0080)	3	x	(0008,0080)	
Institution Address	(0008,0081)	3	-	(0008,0081)	
Institution Code Sequence *(universal Sequence Match)*	(0008,0082)	3	-		
>Code Value	(0008,0100)	1C	-		
>Coding Scheme Designator	(0008,0102)	1C	-		
>Coding Scheme Version	(0008,0103)	3	-		
>Code Meaning	(0008,0104)	3	-		
Admission ID	(0038,0010)	2	x		
Issuer of Admission ID	(0038,0011)	3	-		
Visit Status					
Visit Status ID	(0038,0008)	3	-		
Current Patient Location	(0038,0300)	2	x		
Patient's Institution Residence	(0038,0400)	3	-		
Visit Comments	(0038,4000)	3	-		
Visit Relationship					
Referenced Study Sequence *(universal Sequence Match)*	(0008,1110)	3	-		
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Referenced Patient Sequence *(universal Sequence Match)*	(0008,1120)	2	-		(0008,1120)
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Visit Admission					
Referring Physician's Name	(0008,0090)	2	x	(0008,0090)	
Referring Physician's Address	(0008,0092)	3	-		
Referring Physician's Phone Numbers	(0008,0094)	3	-		
Admitting Diagnosis Description	(0008,1080)	3	x	(0008,1080)	
Admitting Diagnosis Code Sequence *(universal Sequence Match)*	(0008,1084)	3	-		
>Code Value	(0008,0100)	1C	-		
>Coding Scheme Designator	(0008,0102)	1C	-		
>Coding Scheme Version	(0008,0103)	3	-		
>Code Meaning	(0008,0104)	3	-		
Route of Admissions	(0038,0016)	3	-		
Admitting Date	(0038,0020)	3	-		
Admitting Time	(0038,0021)	3	-		
Patient Identification					
Patient's Name	(0010,0010)	1	x	(0010,0010)	(0010,0010)
Patient ID	(0010,0020)	1	x	(0010,0020)	(0010,0020)
Issuer of Patient ID	(0010,0021)	3	-	(0010,0021)	
Other Patient IDs	(0010,1000)	3	x	(0010,1000)	
Other Patient Names	(0010,1001)	3	x	(0010,1001)	
Patient's Birth Name	(0010,1005)	3	-	(0010,1005)	
Patient's Mother's Birth Name	(0010,1060)	3	-	(0010,1060)	

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
Medical Record Locator	(0010,1090)	3	-	(0010,1090)	
Patient Demographic					
Patient's Birth Date	(0010,0030)	2	x	(0010,0030)	(0010,0030)
Patient's Birth Time	(0010,0032)	3	-	(0010,0032)	
Patient's Sex	(0010,0040)	2	x	(0010,0040)	(0010,0040)
Patient's Insurance Plan Code Sequence *(universal Sequence Match)*	(0010,0050)	3	-	(0010,0050)	
>Code Value	(0008,0100)	1C	-		
>Coding Scheme Designator	(0008,0102)	1C	-		
>Coding Scheme Version	(0008,0103)	3	-		
>Code Meaning	(0008,0104)	3	-		
Patient's Age	(0010,1010)	3	x	(0010,1010)	
Patient's Size	(0010,1020)	3	x	(0010,1020)	
Patient's Weight	(0010,1030)	2	x	(0010,1030)	
Patient's Address	(0010,1040)	3	x	(0010,1040)	
Military Rank	(0010,1080)	3	x	(0010,1080)	
Branch of Service	(0010,1081)	3	-	(0010,1081)	
Country of Residence	(0010,2150)	3	-	(0010,2150)	
Region of Residence	(0010,2152)	3	-	(0010,2152)	
Patient's Telephone Numbers	(0010,2154)	3	-	(0010,2154)	
Ethnic Group	(0010,2160)	3	x	(0010,2160)	
Occupation	(0010,2180)	3	-	(0010,2180)	
Patient's Religious Preference	(0010,21F0)	3	-	(0010,21F0)	
Patient Comments	(0010,4000)	3	x	(0010,4000)	
Patient Data Confidentiality Constraint Description	(0040,3001)	2	x	(0040,3001)	
Patient Medical					
Medical Alerts	(0010,2000)	2	x	(0010,2000)	
Contrast Allergies	(0010,2110)	2	x	(0010,2110)	
Pregnancy Status	(0010,21C0)	2	x	(0010,21C0)	
Smoking Status	(0010,21A0)	3	x	(0010,21A0)	
Last Menstrual Date	(0010,21D0)	3	x	(0010,21D0)	
Additional Patient History	(0010,21B0)	3	x	(0010,21B0)	
Special Needs	(0038,0050)	2	x	(0038,0050)	
Patient State	(0038,0500)	2	x	(0038,0500)	
Patient Relationship					
Referenced Study Sequence *(universal Sequence Match)*	(0008,1110)	3	-		
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Referenced Visit Sequence *(universal Sequence Match)*	(0008,1125)	3	-		
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Referenced Patient Alias Sequence *(universal Sequence Match)*	(0038,0004)	3	-		
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		

Table 36 Basic Worklist C-FIND-RSP Return Key Attributes

Note on Specific Character Set (0008,0005)

If the C-FIND-RQ does not contain "specific characters", 0008,0005 will not be part of the C-FIND-RQ. If, however, the C-FIND-RSP contains "specific characters" in any of the Return Keys, it is expected, that 0008,0005 is part of the C-FIND-RSP from the MWL SCP.

11.1.2.1.4 Associated Real-World Activity – Get Worklist

With "Get Worklist" in the patient based Worklist Query dialog, the entered attributes are used to form a worklist request identifier. With the response data the Patient Registration dialog can be updated to perform examination in advance. The response data are additionally placed in the scheduler database.

11.1.2.1.5 Proposed Presentation Contexts – Get Worklist

This RWA will propose the same Presentation Contexts as with “Update Worklist”. Please see table in section 11.1.2.1.2.

11.1.2.1.6 SOP Specific Conformance – Get Worklist

11.1.2.1.6.1 Search Key Attributes of the Worklist C-FIND

The AXIOM Sensis XP DICOM worklist SCU supports “narrow worklist queries” with all required search keys. The following tables describe the “narrow query” search keys that the SCU supports.

Attribute Name	Tag	Matching Key Type	Query Value
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	R	input from UI or <zero length>
>Scheduled Performing Physician’s Name	(0040,0006)	R	input from UI or <zero length>
Requested Procedure			
Requested Procedure ID	(0040,1001)	O	input from UI or <zero length>
Imaging Service Request			
Accession Number	(0008,0050)	O	input from UI or <zero length>
Referring Physician’s Name	(0008,0090)	O	input from UI or <zero length>
Visit Status			
Current Patient Location	(0038,0300)	O	input from UI or <zero length>
Patient Identification			
Patient’s Name	(0010,0010)	R	input from UI or <zero length>
Patient ID	(0010,0020)	R	input from UI or <zero length>

Table 37 Patient based "narrow query" Search Key Attributes

11.1.2.1.6.2 Return Key Attributes of the Worklist C-FIND

Please see list for “Update Worklist” RWA.

11.1.2.1.6.3 Status Codes of the Worklist C-FIND

The worklist SCU interprets following status codes:

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

Table 38 C-FIND-RSP Status

12 Implementation Model MPPS

The Modality Performed Procedure Step Service class defines an application-level class of service that facilitates the transfer of procedure, billing and radiation dose information from the imaging modality to the information system. The Performed Procedure Step is created and set by the AE and supplies the SCP with the information about a real-world procedure which is performed on the modality. The AXIOM Sensis XP DICOM Modality Performed Procedure Step application supports the MPPS service as SCU.

12.1 Application Data Flow Diagram

The AXIOM Sensis XP DICOM network implementation acts as SCU for the Modality Performed Procedure Step SOP Class. The product target Operating System is Microsoft Windows XP.

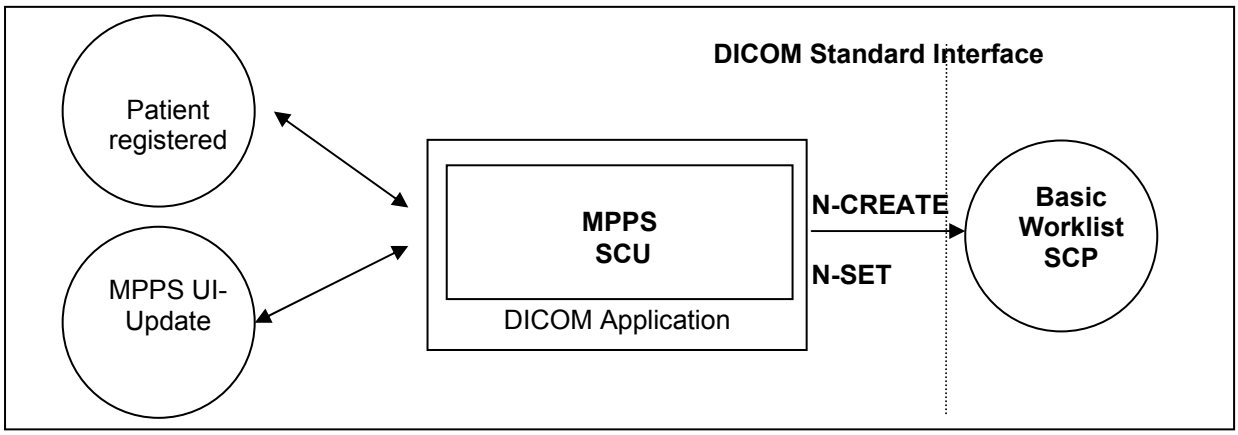

Figure 7 AXIOM Sensis XP Application Flow Diagram – MPPS SCU

12.2 Functional Definitions of Application Entities

With registering a Patient (i.e. a Scheduled Procedure Step from Worklist), the AXIOM Sensis XP DICOM application will create a MPPS Instance and communicate it to the MPPS SCP.

It is configurable to set the states of all related MPPS to "Completed" when a patient is closed. Furthermore, a manual update can be performed with the AXIOM Sensis XP MPPS user interface. From the user interface it is possible to set the state of the MPPS to “Completed” or “Discontinued”. After that the DICOM application will no longer allow updates on the related MPPS Instance.

The AXIOM Sensis XP will not only allow a "1:1 -relationship" of Scheduled Procedure Steps and Performed Procedure Steps, but also supports the "simple group-case" (grouping several SPS of the same Requested Procedure) , "complex group-case" (grouping several SPS from different Requested Procedures) and "append case" from the respective IHE-scenarios.

The AXIOM Sensis XP will support creation of “unscheduled cases” by allowing MPPS Instances to be communicated for locally registered Patients.

12.3 Sequencing of real World Activities

An MPPS Update is only possible, if the MPPS Instance was created with Patient Registration before.

13 AE Specification MPPS

13.1 Modality Performed Procedure Step AE Specification

The Modality Performed Procedure Step SCU (Patient Registration and MPPS UI) provide information about a performed real-world Procedure to a remote SCP (Information System).

SIEMENS AXIOM Sensis XP DICOM products provide Standard Conformance to the following DICOM V3.0 SOP Class as an SCU:

SOP Class Name	SOP Class UID
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3

Table 39 SOP Classes as an SCU

13.1.1 Association Establishment Policies

13.1.1.1 General

The creation of MPPS Instance is done automatically by AXIOM Sensis XP whenever a patient is registered for image acquisition through the Patient Registration dialog.

Further updates on the MPPS data can be done interactively from the related MPPS user interface. The MPPS “Complete” or “Discontinued” states can only be set from user interface.

The default PDU size used will be 256 KB.

13.1.1.2 Number of Associations

The AXIOM Sensis XP DICOM application initiates one association at a time to create or set MPPS instance.

13.1.1.3 Asynchronous Nature

The AXIOM Sensis XP DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

13.1.1.4 Implementation Identifying Information

Implementation Class UID	1.3.12.2.1107.5.9.20000101
Implementation Version Name	SIEMENS_SWFVE31F

Table 40 Implementation Identifying Information

13.1.2 Association Initiation Policy

The AXIOM Sensis XP DICOM Application Entity acts as a Service Class User (SCU) for the

- Modality Performed Procedure Step Service Class (to notify a RIS about status of a procedure while it is performed).

To do so, the AXIOM Sensis XP will issue a

- N-CREATE DIMSE according to the CREATE Modality Performed Procedure Step SOP Instance operation or a
- N-SET DIMSE to update the contents and state of the MPPS according to the SET Modality Performed Procedure Step Information operation.

13.1.2.1 Real World Activity

13.1.2.1.1 Associated Real-World Activity - Patient registered

A patient is registered by the Patient Registration “Exam” action. From this event the trigger to create a MPPS Instance is derived. The related Instance is then immediately communicated to the configured RIS system. An association is established and the MPPS Instance is sent.

13.1.2.1.2 Proposed Presentation Contexts - Patient registered

The AXIOM Sensis XP DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

Table 41 Proposed Presentation Contexts - MPPS

13.1.2.1.3 SOP Specific Conformance Statement- Patient registered

13.1.2.1.3.1 Attributes used for the Performed Procedure Step N-CREATE

The Siemens AXIOM Sensis XP DICOM Modality Performed Procedure Step SCU informs the remote SCP when the examination of a scheduled procedure step will be performed (i.e. the patient is registered). The N-CREATE message is sent when the examination is started with successful registration of the patient data. The following table describes the supported attributes of a N-CREATE message.

Attribute Name	Tag	Type	Value
SOP Common			
Specific Character Set	(0008,0005)	1C	from MWL or created
Performed Procedure Step Relationship			
Scheduled Step Attribute Sequence	(0040,0270)	1	
>Study Instance UID	(0020,000D)	1	from MWL or created
>Referenced Study Sequence	(0008,1110)	2	from MWL or <zero length>
>>Referenced SOP Class UID	(0008,1150)	1C	
>>Referenced SOP Instance UID	(0008,1155)	1C	
>Accession Number	(0008,0050)	2	from MWL or user input
>Placer Order Number/Imaging Service Request	(0040,2016)	3	from MWL or <zero length>
>Filler Order Number/Imaging Service Request	(0040,2017)	3	from MWL or <zero length>
>Requested Procedure ID	(0040,0001)	2	from MWL or user input
>Requested Procedure Description	(0032,1060)	2	from MWL or <zero length>

Attribute Name	Tag	Type	Value
>Scheduled Procedure Step ID	(0040,0009)	2	from MWL or <zero length>
>Scheduled Procedure Step Description	(0040,0007)	2	from MWL or <zero length>
>Scheduled Protocol Code Sequence	(0040,0008)	2	from MWL or <zero length>
>>Code Value	(0008,0100)	1C	
>>Coding Scheme Designator	(0008,0102)	1C	
>>Coding Scheme Version	(0008,0103)	3	
>>Code Meaning	(0008,0104)	3	
Patient's Name	(0010,0010)	2	from MWL or user input
Patient ID	(0010,0020)	2	from MWL or user input
Patient's Birth Date	(0010,0030)	2	from MWL or user input
Patient's Sex	(0010,0040)	2	from MWL or user input
Referenced Patient Sequence	(0008,1120)	2	from MWL or <zero length>
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Performed Procedure Step Information			
Performed Procedure Step ID	(0040,0253)	1	From SPS ID or created
Performed Station AE Title	(0040,0241)	1	own AE Title
Performed Station Name	(0040,0242)	2	own hostname
Performed Location	(0040,0243)	2	from SPS location or <zero length>
Performed Procedure Step Start Date	(0040,0244)	1	created
Performed Procedure Step Start Time	(0040,0245)	1	created
Performed Procedure Step Status	(0040,0252)	1	"IN PROGRESS"
Performed Procedure Step Description	(0040,0254)	2	from SPS Description or <zero length>
Performed Procedure Type Description	(0040,0255)	2	<zero length>
Procedure Code Sequence	(0008,1032)	2	from Requested Procedure Code or <zero length>
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	
>Coding Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	
Performed Procedure Step End Date	(0040,0250)	2	<zero length>
Performed Procedure Step End Time	(0040,0251)	2	<zero length>
Comments on the Performed Procedure Steps	(0040,0280)	3	<zero length>
Image Acquisition Results			
Modality	(0008,0060)	1	XA
Study ID	(0020,0010)	2	from Requested Procedure ID or created
Performed Protocol Code Sequence	(0040,0260)	2	from Scheduled Protocol Code Sequence or <zero length>
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	
>Coding Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	
Performed Series Sequence	(0040,0340)	2	
>Performing Physician's Name	(0008,1050)	2C	from MWL or user input
>Operator's Name	(0008,1070)	2C	User input
>Series Instance UID	(0020,000E)	1C	created
>Series Description	(0008,103E)	2C	<zero length>
>Retrieve AE Title	(0008,0054)	2C	<zero length>
>Protocol Name	(0018,1030)	1C	from organ program
>Referenced Image Sequence	(0008,1140)	2C	<zero length>
>Referenced Non-Image Composite SOP Instance Sequence	(0040,0220)	2C	<zero length>
Radiation Dose			

Attribute Name	Tag	Type	Value
Anatomic Structure, Space or Region Sequence	(0008,2229)	3	<zero length>
Total Time of Fluoroscopy	(0040,0300)	3	<zero length>
Total Number of Exposures	(0040,0301)	3	<zero length>
Distance Source to Detector	(0018,1110)	3	<zero length>
Distance Source to Entrance	(0040,0306)	3	<zero length>
Entrance Dose	(0040,0302)	3	<zero length>
Exposed Area	(0040,0303)	3	<zero length>
Image Area Dose Product	(0018,115E)	3	<zero length>
Comments on Radiation Dose	(0040,0310)	3	<zero length>
Billing and Material Management Code			
Billing Procedure Step Sequence	(0040,0320)	3	<zero length>
Film Consumption Sequence	(0040,0321)	3	
>Number of Films	(2100,0170)	3	<zero length>
>Medium Type	(2000,0030)	3	<zero length>
>Film Size ID	(2010,0050)	3	<zero length>
Billing Supplies and Devices Sequence	(0040,0324)	3	
>Billing Item Sequence	(0040,0296)	3	<zero length>
>Quantity Sequence	(0040,0293)	3	
>>Quantity	(0040,0294)	3	<zero length>
>>Measuring Units Sequence	(0040,0295)	3	<zero length>

Table 42 Performed Procedure Step N-CREATE Attributes

13.1.2.1.3.2 Status Codes of the Performed Procedure Step N-CREATE

The Performed Procedure Step SCU interprets following status codes:

Service Status	Meaning	Error Codes (0000.0900)
Failure	Processing Failure	0110
	No such attribute	0105
	Invalid attribute value	0106
	Duplicate SOP Instance	0111
	No such SOP Instance	0112
	No such SOP Class	0118
	Class Instance conflict	0119
	Missing attribute	0120
	Missing attribute value	0121
	Resource limitation	0213
Success	MPPS Instance created	0000

Table 43 MPPS N-CREATE Response Status

13.1.2.1.4 Associated Real-World Activity – MPPS UI-Update

With the MPPS UI the status of the MPPS Instance can be set to “COMPLETED” or “DISCONTINUED”. During performance of the procedure the status will remain “IN PROGRESS”.

13.1.2.1.5 Proposed Presentation Contexts – MPPS UI-Update

This RWA will propose the same Presentation Contexts as with “Patient registered”. Please see table in section 13.1.2.1.2.

13.1.2.1.6 SOP Specific Conformance Statement – MPPS UI-Update

13.1.2.1.6.1 Attributes used for the Performed Procedure Step N-SET

The Siemens AXIOM Sensis XP DICOM Modality Performed Procedure Step SCU informs the remote SCP about the performed examination and its status. The N-SET message is sent after each acquisition (status "IN PROGRESS") and per finished examination (finished status “COMPLETED” or incomplete status “DISCONTINUED”). The following table describes the supported attributes of a N-SET message.

Attribute Name	Tag	Type	Value
Performed Procedure Step Information			
Performed Procedure Step Status	(0040,0252)	3	"IN PROGRESS" during procedure, “COMPLETED” or “DISCONTINUED” for final N-SET
Performed Procedure Step Description	(0040,0254)	3	from SPS Description or user input
Performed Procedure Type Description	(0040,0255)	3	User input
Procedure Code Sequence	(0008,1032)	3	from Requested Procedure
>Code Value	(0008,0100)	1C	N/A
>Coding Scheme Designator	(0008,0102)	1C	N/A
>Coding Scheme Version	(0008,0103)	3	N/A
>Code Meaning	(0008,0104)	3	N/A
Performed Procedure Step End Date	(0040,0250)	1	created
Performed Procedure Step End Time	(0040,0251)	1	created
Image Acquisition Results			
Performed Protocol Code Sequence	(0040,0260)	3	from Scheduled Protocol Code Sequence
>Code Value	(0008,0100)	1C	N/A
>Coding Scheme Designator	(0008,0102)	1C	N/A
>Coding Scheme Version	(0008,0103)	3	N/A
>Code Meaning	(0008,0104)	3	N/A
Performed Series Sequence	(0040,0340)	1	N/A
>Performing Physician’s Name	(0008,1050)	2C	from MWL or user input
>Protocol Name	(0018,1030)	1C	from related SOP Instance
>Operator’s Name	(0008,1070)	2C	user input
>Series Instance UID	(0020,000E)	1C	from related SOP Instance
>Series Description	(0008,103E)	2C	from related SOP Instance
>Retrieve AE Title	(0008,0054)	2C	N/A
>Referenced Image Sequence	(0008,1140)	2C	Series related SOP Instances as items
>>Referenced SOP Class UID	(0008,1150)	1C	N/A
>>Referenced SOP Instance UID	(0008,1155)	1C	N/A
>Referenced Standalone SOP Instance Sequence	(0040,0220)	2C	<zero length>
Radiation Dose			
Total Number of Exposures	(0040,0301)	3	N/A
Distance Source to Detector	(0018,1110)	3	N/A
Image Area Dose Product	(0018,115E)	3	N/A
Billing and Material Management Code			
Film Consumption Sequence	(0040,0321)	3	N/A
>Number of Films	(2100,0170)	3	<zero length>
>Medium Type	(2000,0030)	3	<zero length>
>Film Size ID	(2010,0050)	3	<zero length>

Table 44 Performed Procedure Step N-SET Attributes

13.1.2.1.6.2 Status Codes of the Performed Procedure Step N-SET

The Performed Procedure Step SCU interprets following status codes:

Service Status	Meaning	Error Codes (0000.0900)
Failure	Processing Failure: Performed Procedure Step Object may no longer be updated.	0110
	No such attribute	0105
	Invalid attribute value	0106
	No such SOP Instance	0112
	Invalid Object instance	0117
	No such SOP Class	0118
	Class Instance conflict	0119
	Missing attribute value	0121
	Resource limitation	0213
Success	MPPS Instance set	0000

Table 45 MPPS N-SET Response Status

13.1.2.1.6.3 Performed Procedure Step ID without MPPS

Handling of Performed Procedure Step ID in case

- MPPS is not configured or
- Unscheduled case

The attribute “Performed Procedure Step ID” (0040,0235) will be encoded based on "YYYYMMDDHHMMSS". This date and time is based on the time when the first image is acquired. The "Performed Procedure Step ID" stays the same for all acquired or derived images as long as the patient is re-registered. A re-registered patient with a new study or new series within the existing study will get a newly assigned "Performed Procedure Step ID".

14 Communication Profiles

14.1 Supported Communication Stacks

The Siemens AXIOM Sensis XP DICOM application provides DICOM TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.
The product target Operating System is Microsoft Windows XP.

14.1.1 TCP/IP Stack

The AXIOM Sensis XP DICOM application uses the TCP/IP stack from the target operating system upon which it executes. It uses the MergeCOM-3 subroutine library from Merge Technologies Inc. that is based on a Berkeley socket interface.

14.1.1.1 API

The AXIOM Sensis XP DICOM application uses the MergeCOM library that is based on a TCP/IP socket interface.

14.1.1.2 Physical Media Support

The AXIOM Sensis XP DICOM application is indifferent to the physical medium over which TCP/IP executes; it inherits this from the target operating system upon which it executes.

15 Extensions / Specializations / Privatizations

15.1.1 Standard Extended / Specialized / Private SOPs

Please refer to Annex A for further information on these topics. A detailed overview is given there.

15.1.2 Private Transfer Syntaxes

Not applicable

16 Configuration

16.1 AE Title/Presentation Address Mapping

To ensure unique identification within the network the hostname should be used as part of the AE Titles (see examples below, hostname = NAME1). The string can be up to 16 characters long and must not contain any extended characters, only 7-bit ASCII characters (excluding Control Characters) are allowed according to DICOM Standard.

Note: the current implementation of syngo does not support the full DICOM Standard. Spaces and special characters (like &<> ") in the AE title string are not supported.

16.1.1 DICOM Verification

The Verification Service uses the AE configuration of the DICOM Service that is checked with the C-ECHO message. e.g. Verification will use the Storage AE, if initiated to check the configuration of a remote DICOM node.

16.1.2 DICOM AE Titles

Within syngo there are local application entity titles for HIS/RIS, Study Transfer and Print. They can be configured via Service-UI in "Configuration / DICOM / General".

16.1.2.1 DICOM Storage AE Title

The DICOM Storage application provides the application entity title which can be configured via Service UI in "Configuration/DICOM/General":

e.g. STU_NAME1

The port number is set to the fixed value of

104

16.1.2.2 DICOM Query/Retrieve AE Title

The DICOM Query/Retrieve application uses the same application entity title as the DICOM Storage AE.

16.1.2.3 DICOM Modality Worklist AE Title

The DICOM Modality Worklist application provides the application entity title which can be configured via Service UI in "Configuration/DICOM/General", e.g. HRI_NAME1.

16.2 Configurable Parameters

The Application Entity Titles, host names and port numbers for remote AE are configured using the AXIOM Sensis XP Service/Installation Tool. For each AET the list of services supported can be configured.

16.2.1 Storage, Storage Commitment and Query/Retrieve

The AXIOM Sensis XP Service/Installation Tool can be used to set the AETs, port-numbers, host-names, IP-addresses and capabilities for the remote nodes (SCPs). The service user can select transfer syntaxes, compression modes and query models for each SCP separately.

The sending of the private SOP Class (Exam Protocol) can be disabled.

Additional configurable parameters for Storage Commitment are:

- flag to indicate whether the association will be kept open to receive the response or to close the association and be prepared to receive the response on another association.
- time-out which defines how long the association of N-ACTION is kept to receive a N-EVENT-REPORT on the same association. The same value is used to wait for a N-EVENT-REPORT on an other association (default 1 h).

16.2.2 Modality Worklist

The Service application can be used to set the AET, port number, host name, IP address, capabilities and time-outs for the remote node (SCP)

Additional configurable parameters for Modality Worklist Query are:

- Query Waiting time - the time to wait for the C-FIND-RSP after sending the C-FIND-RQ (default 20 sec.)
- Max Query Match Number - the maximum number of entries accepted in one worklist (default is 200)
- Query Interval: the time between two C-FIND-RQ to the Hospital Information system (default is 60 min., minimum is 3 min., maximum is 1440 min. i.e. 24 hours)
- Broad Worklist Query behavior (two values are defined):
  - Set the AE Title search attribute to the own AE Title, and the Modality search attribute to <zero length>.
  - Set the Modality search attribute to the own modality and the AE Title search attribute to <zero length>.

16.3 Default Parameters

This installation tool also uses some default parameters:

- max PDU size set to 262144 Bytes (256 KB)
- time-out for accepting/rejecting an association request: 60 s
- time-out for responding to an association open/close request: 60 s
- time-out for accepting a message over network: 60 s
- time-out for waiting for data between TCP/IP-packets: 60 s

The time-outs for waiting for a Service Request/Response message from the remote node are as follows:

- for Storage SCP/SCU: 600 s
- for Storage Commitment SCU:
  time-out for Response to N-ACTION: 600 s
- for Query/Retrieve SCP/SCU: 600 s

17 Support of Extended Character Sets

The AXIOM Sensis XP DICOM application supports the ISO 8859 Latin 1 (ISO-IR 100) character set.

Also the Japanese language character sets JIS X 0201 (ISO-IR 13 Japanese katakana and ISO-IR 14 Japanese romaji), JIS X 0208 (ISO-IR 87 Japanese kanji) and JIS X 0212 (ISO-IR 159 Supplementary Japanese kanji) are supported in the DICOM interfaces but will not be correctly represented in the generated reports.

When there is a mismatch between the "Specific Character Set" attribute (0008,0005) and the characters encoded in an IOD received by the system, then the following measures are taken to make the characters DICOM conform:

- Try to import with ISO_IR 100. If ISO_IR 100 fails, convert each illegal character to a ’?’.

18 Application Profile Conformance Statement

This chapter defines the Conformance Statement to all “Offline Media Application Profiles (incl. private extensions)” supported by the AXIOM Sensis XP archive options.

Those application profiles supported shall be:

- Basic Cardiac
- 1024 Extended Cardiac Application Profile
- General Purpose CDR Profiles
- AXIOM Sensis XP private Application Profile

18.1.1 Introduction

18.1.2 Purpose

This DICOM Conformance Statement is written according to part PS 3.2 of [DICOM] .

The applications described in this conformance statement are the SIEMENS AXIOM Sensis XP based on *syngo*® software[a]. The AXIOM Sensis XP DICOM offline media storage service implementation acts as FSC, FSU and/or FSR for the specified application profiles and the related SOP Class instances.

18.1.3 Scope

This DICOM Conformance Statement refers to SIEMENS AXIOM Sensis XP

18.1.4 Definitions, Abbreviations

18.1.4.1 Definitions

DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DIMSE-C	DICOM Message Service Element with Composite information objects

18.1.5 Abbreviations

ACR	American College of Radiology
AE	DICOM Application Entity
ASCII	American Standard Code for Information Interchange
DB	Database
DVD	Digital Versatile Disk
DCS	DICOM Conformance Statement
FSC	File Set Creator
FSR	File Set Reader
FSU	File Set Updater
IOD	DICOM Information Object Definition
ISO	International Standard Organization
MOD	Magneto-optical Disk
NEMA	National Electrical Manufacturers Association
O	Optional Key Attribute

[a] *syngo* is a registered trademark of Siemens AG.

PDU	DICOM Protocol Data Unit
R	Required Key Attribute
RWA	Real-World Activity
U	Unique Key AttributeReferences

18.1.6 References

[DICOM] Digital Imaging and Communications in Medicine (DICOM), NEMA PS 3.1-3.18, 2008

18.1.7 Remarks

DICOM and this Conformance Statement, by itself, does not guarantee interoperability. However, the Conformance Statement facilitates a first-level validation for interoperability between different applications supporting the same DICOM functionality as SCU and SCP, respectively.

This Conformance Statement is not intended to replace validation with other DICOM equipment to ensure proper exchange of information intended.

The scope of this Conformance Statement is to facilitate communication with Siemens and other vendors' Medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM Standard [DICOM] . However, by itself it is not guaranteed to ensure the desired interoperability and a successful interconnectivity.

The user should be aware of the following important issues:

- Interoperability
  Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into a networked environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this Conformance Statement does not guarantee interoperability of SIEMENS equipment with non-SIEMENS equipment. It is the user's responsibility to analyze thoroughly the application requirements and to specify a solution that integrates SIEMENS equipment with non-SIEMENS equipment.
- Validation
  SIEMENS equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this Conformance Statement. Where SIEMENS equipment is linked to non-SIEMENS equipment, the first step is to compare the relevant Conformance Statements. If the Conformance Statements indicate that successful information exchange should be possible, additional validation test will be necessary to ensure the functionality, performance, accuracy and stability of image and image related data. It is the responsibility of the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.
- New versions of the DICOM Standard
  The DICOM Standard will evolve in future to meet the user's growing requirements and to incorporate new features and technologies. SIEMENS is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, SIEMENS reserves the right to make changes to its products or to discontinue its delivery. The user should ensure that any non-SIEMENS provider linking to SIEMENS equipment, also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into SIEMENS equipment may lead to loss of connectivity (in case of networking) and incompatibility (in case of media).

18.2 Implementation Model

18.2.1 Application Data Flow Diagram

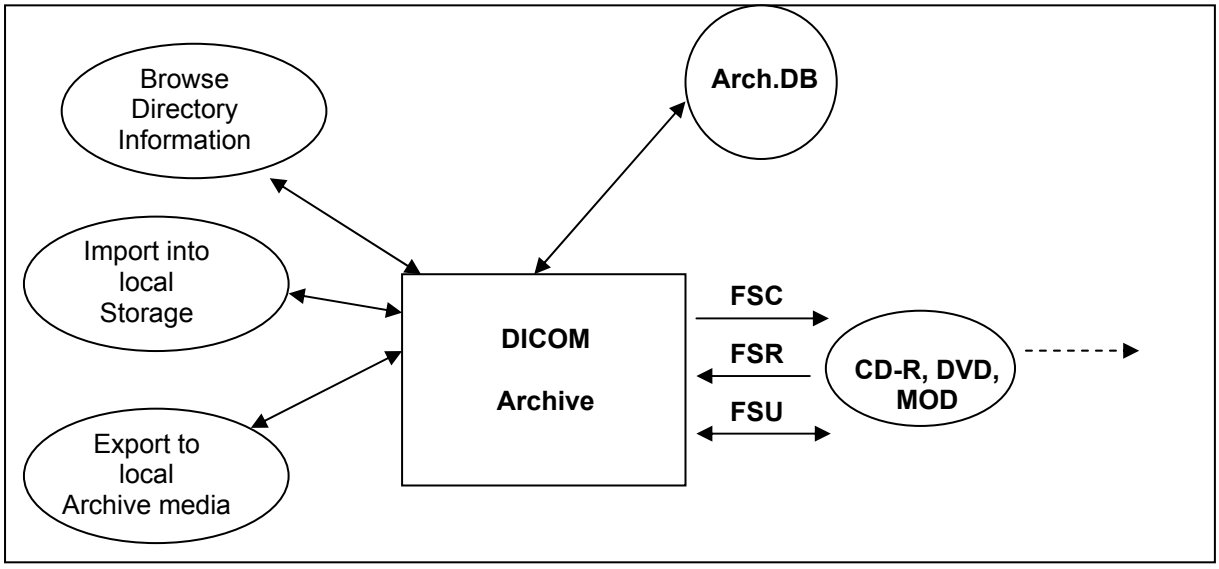

Figure 8 Application Data Flow Diagram

The DICOM archive application will serve as an interface to the CD-R offline medium device. It serves interfaces to include the offline media directory into the browser and to copy SOP instances to a medium or retrieve SOP Instances from medium into local storage.

The DICOM Archive application will support the 120mm CD-R and DVD medium, the 130mm 2.3 GB R/W MOD and the 130mm 4.1 GB R/W MOD media.

The FSU role will update new SOP Instances only to media with pre-existing File-sets conforming to the Application Profiles supported.

The contents of the DICOMDIR will be temporarily stored in Archive-Database.

18.2.2 Functional Definitions of AEs

The AXIOM Sensis XP DICOM offline media storage application consists of the DICOM Archive application entity serving all interfaces to access offline media. The DICOM Archive application is capable of

1. creating a new File-set onto an unwritten medium (Export to…).
2. updating an existing File-set by writing new SOP Instances onto the medium (Export to...).
3. importing SOP Instances from the medium onto local storage
4. reading the File-sets DICOMDIR information into temporary database and pass it to display applications.

18.2.3 Sequencing of Real-World Activities

The DICOM Archive application will not perform updates before the Directory information of the DICOMDIR is completely read.

When performing updates, the SOP instances are checked for existence before updating. Duplicate instances will be avoided.

18.2.4 File Meta Information Options

Implementation Class UID	1.3.12.2.1107.5.9.20000101
Implementation Version Name	SIEMENS_SWFVE31F

Table 46 File Meta Information Options

18.3 AE Specifications

18.3.1 DICOM Archive Specification

The DICOM Archive provides Standard conformance to Media Storage Service Class (Interchange Option). In addition Augmented conformance is provided to store extra data attributes important for the full feature support of the AXIOM Sensis XP product SW. Details are listed in following Table:

Application Profiles Supported	Real-World Activity	Role	SC Option
PRI-XAMAS-CD AUG-XA1K-CD *1	Browse Directory Information	FSR	Interchange
	Import into local Storage	FSR	Interchange
	Export to local Archive Media	FSC, FSU	Interchange
STD-GEN-CD STD-XABC-CD STD-XA1K-CD	Browse Directory Information	FSR	Interchange
	Import into local Storage	FSR	Interchange

*1 – With no Private SOP Class used, the PRI-SYNGO-CD profile definitions are appropriate to describe the augmentation of the related -STD Profiles.

Table 47 Application profiles, Activities, and Roles for DICOM Archive

On AXIOM Sensis based Systems, the Private Extended Syngo Profiles (PRI-SYNGO-CD, PRI-SYNGO-MOD) will be preferably used by the system. The General Purpose Interchange Profile (STD-GEN-CD, STD-GEN-MOD), Basic Cardiac Profile (STD-XABC-CD) and 1024 X-Ray Angiographic Profile (STD-XA1K-CD) will be supported with read, write, and update capability of the related media.

For DVD and MOD profiles the same rules apply as for CD profiles.

18.3.1.1.1 File Meta Information for the Application Entity

The Source Application Entity Title is set by configuration. See Chapter “Configuration” for details.

18.3.1.2 Real-World Activities for this Application Entity

18.3.1.2.1 Real-World Activity: Browse Directory Information

The DICOM Archive application acts as FSR using the interchange option when requested to read the media directory.

The DICOM archive application will read the DICOMDIR and insert those directory entries, that are valid for the application profiles supported, into a local database. The database can the then be used for browsing media contents.

Note

Icon Image SQ is also supported in DICOMDIR. But only those Icon Images with Bits Allocated (0028,0100) equal to 8 and size of 64x64 or 128x128 pixels are imported into database and are visible in the Browser.

18.3.1.2.1.1 Application Profiles for the RWA: Browse Directory Information

See Table in Chapter 18.3.1 for the Application Profiles listed that invoke this Application Entity for the Browse Directory Information RWA.

18.3.1.2.2 Real-World Activity: Import into local Storage

The DICOM Archive application acts as FSR using the interchange option when requested to read SOP Instances from the medium into the local storage.

The SOP Instance selected from the media directory will be copied into the local storage. Only SOP Instances, that are valid for the application profile supported and are listed as supported by the Storage SCP Conformance section (see chapter 5.1.3.1.2), can be retrieved from media storage. This is due to the fact that the Browse Directory Information will filter all SOP Instances not matching the Application profiles supported.

During operation no "Attribute Value Precedence" is applied to the SOP Instances. Detached Patient Management is not supported.

For media conforming to the STD-GEN-CD Profile the following SOP classes will be supported as an FSR:

Information Object Definition	SOP Class UID	Transfer Syntax UID
X-Ray Angiographic Image	1.2.840.10008.5.1.4.1.1.12.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1
Cardiac Electrophysiology Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.3.1	Explicit VR Little Endian 1.2.840.10008.1.2.1
CSA Non-Image	1.3.12.2.1107.5.9.1	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1

Table 48 STD-GEN-CD Supported SOP Classes for FSR Role

18.3.1.2.2.1 Application Profiles for the RWA: Import into local Storage

See Table in section 18.3.1 for the Application Profiles listed that invoke this Application Entity for the Import into Local Storage RWA.

18.3.1.2.3 Real-World Activity: Export to local Archive Media

The DICOM Archive application acts as FSU (for media with existing DICOM file-set) or FSC (media not initialized) using the interchange option when requested to copy SOP Instances from the local storage to local Archive Medium.

The DICOM Archive application will receive a list of SOP Instances to be copied to the local archive medium. According to the state of the medium inserted (new medium, Medium with DICOM file-set) the validity of the SOP Instances according to the applicable profile is checked. Only valid SOP Instances are accepted.

When the DICOM archive application is requested to copy SOP Instances the preferred application profile according configuration (AUG-XA1K-CD or PRI-XAMAS-CD) will be used to validate and copy the referred SOP Instances. When creating a new file-set no Descriptor File will be allocated and the related ID is not used.

The DICOM archive application will not close the medium.

18.3.1.2.3.1 Application Profiles for the RWA: Export to local Archive Media

See Table in section 18.3.1 for the Application Profiles listed that invoke this Application Entity for the Export to local Archive Media RWA.

18.4 Augmented and Private Profiles

18.4.1 Augmented Application Profiles

With no private Siemens Non-Images stored onto Medium, the definitions of the PRI-XAMAS-CD Profile are applicable to denote the augmentations for the STD-XA1K-CD Standard Profile.

Storage of Private Information Objects will only be supported with reference to a Private Application Profile (see next section).

18.4.2 Private Application Profiles

18.4.2.1 PRI-XAMAS-CD

The DICOM Archive application is conforming to the PRI-XAMAS-CD application profile provided in a separate document. Please refer to next section for detailed definition of SOP classes supported in accordance to this Application Profile.

18.5 Extensions, Specialization and Privatization of SOP Classes and Transfer Syntaxes

The SOP Classes listed refer in majority to those created by the equipment to which this conformance Statement is related to. For SOP classes not listed in this section, please refer to the Storage section of the DICOM Conformance Statement of the product. This will include all SOP Instances that can be received and displayed and therefore will be included into offline media storage even though these SOP Instances are not created by the equipment serving the Media Storage Service.

18.5.1 SOP Specific Conformance Statement for Basic Directory

The Basic Directory Header will not contain Information to indicate the current medium is part of a sequence of multiple media holding the Objects of one patient/study in total.

18.5.1.1 Extension, Specialization for SIEMENS Non-Image Objects

According to the PRI-XAMAS Application Profile Class the usage of the Private Creator UIDs and further optional keys for the Directory Records referring to SIEMENS Non-Image Objects are listed in the following tables.

Attribute	Tag	Value used
Private Record UID	(0004,1432)	1.3.12.2.1107.5.9.1
SOP Class UID	(0008,0016)	1.3.12.2.1107.5.9.1

Table 49 Extension, Specialization for SIEMENS Non-Image Objects

For those “Non-Images” no Icon Image Sequence will be generated.

18.6 Configuration

18.6.1 AE Title Mapping

18.6.1.1 DICOM Media Storage AE Title

The DICOM Storage application provides the application entity title:

CsaImageManager

18.7 Support of Extended Character Sets

The Siemens AXIOM Sensis XP DICOM archive application supports the ISO 8859 Latin 1 (ISO-IR 100) character set.

Also the Japanese language character sets JIS X 0201 (ISO-IR 13 Japanese katakana and ISO-IR 14 Japanese romaji), JIS X 0208 (ISO-IR 87 Japanese kanji) and JIS X 0212 (IOS-IR 159 Supplementary Japanese kanji) are supported in the DICOM interfaces but will not be correctly represented in the generated reports.

When there is a mismatch between the SCS tags (0008,0005) and the characters in an IOD received by the system, then the following measures are taken to make the characters DICOM conform:

- Try to import with ISO_IR 100. If ISO_IR 100 fails, convert each illegal character to a '?'.

Annex A: Additional Information

A.1 SIEMENS Waveform IOD description

Attribute	Tag	Value
Group 0002 Length	(0002,0000)	
File Meta Information Version	(0002,0001)	==> binary data; value is 2 bytes long
Media Storage SOP Class UID	(0002,0002)	"1.2.840.10008.5.1.4.1.1.9.3.1"
Media Storage SOP Instance UID	(0002,0003)	"1.3.12.2.1107.5.13.2.serialno.uniqueid"
Transfer Syntax UID	(0002,0010)	"1.2.840.10008.1.2.1"
Implementation Class UID	(0002,0012)	"1.3.12.2.1107.5.9.20000101"
Implementation Version Name	(0002,0013)	"SIEMENS_SWFVE31F"
Source Application Entity Title	(0002,0016)	No value
Private Information Creator UID	(0002,0100)	No value
Private Information	(0002,0102)	No value
Specific Character Set	(0008,0005)	from Configuration
SOP Class UID	(0008,0016)	"1.2.840.10008.5.1.4.1.1.9.3.1"
SOP Instance UID	(0008,0018)	"1.3.12.2.1107.5.13.2.serialno.x.yyyyyyyyyy"
Study Date	(0008,0020)	<yyyymmdd>
Content Date	(0008,0023)	<hhmmss>
Acquisition Datetime	(0008,002A)	<yyyymmdd hhmmss mmmm>
Study Time	(0008,0030)	<hhmmss mmmm>
Content Time	(0008,0033)	<hhmmss mmmm>
Accession Number	(0008,0050)	RIS or "Accession Number" input
Modality	(0008,0060)	"EPS"
Manufacturer	(0008,0070)	“SIEMENS”
Institution Name	(0008,0080)	From system configuration
Referring Physician's Name	(0008,0090)	RIS or "Referring Physician’s name” input
Instance Creation Date	(0008,0012)	Date of report creation
Instance Creation Time	(0008,0013)	Time of report creation
Series Description	(0008,103E)	“WAVEFORM SERIES”
Manufacturer's Model Name	(0008,1090)	“AXIOM Sensis XP”
Patient's Name	(0010,0010)	RIS or "Patient Name" input
Patient ID	(0010,0020)	RIS or "Patient ID" input
Patient's Birth Date	(0010,0030)	<yyyymmdd>
Patient's Sex	(0010,0040)	“M”, “F” or "O"
Other Patient IDs	(0010,1000)	N/A
Other Patient Names	(0010,1001)	N/A
Patient's Age	(0010,1010)	calculated from "DoB" input
Patient’s Address	(0010,1040)	“Address” input”
Military Rank	(0010,1080)	“Military Rank input”
Synchronization Trigger	(0018,106A)	"NO TRIGGER"
Acquisition Time Synchronized	(0018,1800)	"N"
Patient Position	(0018,5100)	From “Patient Position” input
Study Instance UID	(0020,000D)	from RIS or system generated
Series Instance UID	(0020,000E)	System generated
Study ID	(0020,0010)	RIS or "Study ID" input
Series Number	(0020,0011)	System generated
Instance Number	(0020,0013)	System generated
Synchronization Frame of Reference UID	(0020,0200)	UID System generated
Private Creator	(0029,0010)	"SIEMENS CSA HEADER"
Modality Series Header Type	(0029,1018)	"WAVEFORMSERIES"
Modality Series Header Version	(0029,1019)	From system label
Modality Series Header Info	(0029,1020)	N/A
Requesting Physician	(0032,1032)	N/A
Requested Procedure Description	(0032,1060)	From RIS
Study Completion Date	(0032,1050)	<yyyymmdd>
Study Completion Time	(0032,1051)	<hhmmss mmmm>
Acquisition Context Sequence	(0040,0555)	N/A
Annotation Sequence	(0040,B020)	N/A
> Concept-name Code Sequence	(0040,A043)	System generated
>> Code Value	(0008,0100)	System codes
>> Coding Scheme Designator	(0008,0102)	System coding scheme
>> Code Meaning	(0008,0104)	System generated depending on user action
> Referenced Waveform Channels	(0040,A0B0)	System generated depending on affected channel
> Temporal Range Type	(0040,A130)	System generated depending on user action
> Referenced Datetime	(0040,A13A)	<yyyymmdd hhmmss mmmm> See note 1
> Concept Code Sequence	(0040,A168)	N/A

Attribute	Tag	Value
>> Code Value	(0008,0100)	N/A
>> Coding Scheme Designator	(0008,0102)	N/A
>> Code Meaning	(0008,0104)	N/A
Waveform Sequence	(5400,0100)	N/A
> Waveform Originality	(003A,0004)	"ORIGINAL"
> Number of Waveform Channels	(003A,0005)	From configuration
> Number of Waveform Samples	(003A,0010)	Recording length times sampling frequency
> Sampling Frequency	(003A,001A)	"2000"
> Muliplex Group Label	(003A,0020)	From configuration: "ECG", “IECG”, “Pressure”, or “Indicator” or user defined from configuration.
> Channel Definition Sequence	(003A,0200)	N/A
>> Waveform Channel Number	(003A,0202)	System number
>> Channel Label	(003A,0203)	User configuration
>> Channel Status	(003A,0205)	"OK" or “Disconnected”
>> Channel Source Sequence	(003A,0208)	Several channels at “pullback”. See note 2
>>> Code Value	(0008,0100)	System codes
>>> Coding Scheme Designator	(0008,0102)	System coding scheme
>>> Code Meaning	(0008,0104)	System meaning
>> Channel Source Modifier Sequence	(003A,0209)	Electrode positions or “pullback” sites. From configuration
>>> Code Value	(0008,0100)	System codes
>>> Coding Scheme Designator	(0008,0102)	System coding scheme
>>> Code Meaning	(0008,0104)	N/A
>> Channel Sensitivity Units Sequence	(003A,0211)	System generated
>> Channel Sensitivity Correction Factor	(003A,0212)	System generated
>> Channel Baseline	(003A,0213)	System generated
>> Channel Time Skew	(003A,0214)	0
>> Waveform Bits Stored	(003A,021A)	16
>> Filter Low Frequency	(003A,0220)	From configuration
>> Filter High Frequency	(003A,0221)	From configuration
>> Notch Filter Frequency	(003A,0222)	From configuration
>> Channel Label	(003A,0203)	System generated. Defines channel types
> Waveform Bits Allocated	(5400,1004	16
> Waveform Sample Interpretation	(5400,1006)	"SS"
>Waveform Padding Value	(5400,100A)	==> binary data; value is 2 bytes long
> Waveform Data	(5400,1010)	==> binary data;

Table 50 WF IOD description for instances created by AXIOM Sensis® application

Note 1: The time in the recorded data to which the Annotation applies is denoted by the Referenced Datetime (0040,A13A) attribute. The Referenced Waveform Channel (0040,A0B0) refers to the (M,C) value pair of the same channel.

Note 2: The Channel Source Sequence Code Value , Code Scheme Designator and Code Meaning for Waveform IODs created by AXIOM Sensis are internal codes and no standard coding scheme is used.

A.2 SIEMENS Word.Report XA IOD description

Module	Attribute Name	TAG	Type	Comments
Patient	Patient's Name	0010,0010	2	RIS or "Patient Name" input
	Patient ID	0010,0020	2	RIS or "Patient ID" input
	Patient's Birth Date	0010,0030	2	RIS or "Patient Birth Date" input
	Patient's Sex	0010,0040	2	RIS or "Patient Sex" input
General Study	Study Instance UID	0020,000D	1	System generated
	Study Date	0008,0020	2	System generated
	Study Time	0008,0030	2	System generated
	Referring Physician's Name	0008,0090	2	RIS or “Referring Physician’s name" input
	Study ID	0020,0010	2	RIS or "Study ID" input
	Accession Number	0008,0050	2	RIS or "Accession No" input
	Study Description	0008,1030	3	RIS or "Patient Name" input
General Series	Modality	0008,0060	1	"XA"
	Series Instance UID	0020,000E	1	System generated
	Series Number	0020,0011	2	“100”
	Series Date	0008,0021	3	Date of report creation
	Series Time	0008,0031	3	Time of report creation
	Performing Physician's Name	0008,1050	3	“Performing Physician's Name” input
General Equipment	Manufacturer	0008,0070	2	"SIEMENS "
	Institution Name	0008,0080	3	RIS or "Institution Name" input
	Manufacturer's Model Name	0008,1090	3	“AXIOM Sensis IS”
General Image	Image Number	0020,0013	2	“1”
	Patient Orientation	0020,0020	2C	Empty field
	Image Date	0008,0023	2C	Date of report creation
	Image Time	0008,0033	2C	Time of report creation
	Lossy Image Compression	0028,2110	1C	“01” for WORD reports
Image Pixel	Samples per Pixel	0028,0002	1	1
	Photometric Interpretation	0028,0004	1	“MONOCHROME2”
	Rows	0028,0010	1	See Note below
	Columns	0028,0011	1	See Note below
	Bits Allocated	0028,0100	1	8
	Bits Stored	0028,0101	1	8
	High Bit	0028,0102	1	7
	Pixel Representation	0028,0103	1	0000H (unsigned)
	Pixel Data	7FE0, 0010	1	N/A
Cine	Frame Time	0018,1063	1C	“1000” (1sec per frame)
	Recommended Display Frame Rate	0008,2144	3	“1”
Multi-Frame	Number of Frames	0028,0008	1	Number of report pages
	Frame Increment Pointer	0028,0009	1C	00181063H
Frame Pointers	Representative Frame Number	0028,6010	3	“1”
X-Ray Image	Image Type	0008,0008	1	DERIVED\PRIMARY\SINGLE PLANE\.WORD REPORT
	Pixel Intensity Relationship	0028,1040	1	"LIN "
X-Ray Acquisition	KVP	0018,0060	2	Empty field
	Radiation Setting	0018,1155	1	“GR”
	Exposure Time	0018,1150	2C	Empty field
	X-Ray Tube Current	0018,1151	2C	Empty field
XA Positioner	Positioner Motion	0018,1500	2C	“STATIC”
	Positioner Primary Angle	0018,1510	2	Empty field
	Positioner Secondary Angle	0018,1511	2	Empty field
VOI LUT	Window Center	0028,1050	3	0..255
	Window Width	0028,1051	1C	1..254
SOP Common	SOP Class UID	0008,0016	1	XA IOD
	SOP Instance UID	0008,0018	1	System generated

Module	Attribute Name	TAG	Type	Comments
	Specific Character Set	0008,0005	1C	"ISO_IR 100"
	Instance Creation Date	0008,0012	3	Date of report creation
	Instance Creation Time	0008,0013	3	Time of report creation

Table 51 XA IOD description for instances created by AXIOM Sensis XP ® application

Note: The resulting image matrix size depends on the report type

Report Type	Image Type Value 4	Columns	Rows	Comments
WORD document	WORD REPORT	1024	792	For WORD document pages in portrait format Printed and Subsampled from original WORD file → Lossy Compression flag 0028,2110 is set to "01"
	WORD REPORT	792	1024	For WORD document pages in landscape format Printed and Subsampled from original WORD file → Lossy Compression flag 0028,2110 is set to "01"

Table 52 AXIOM Sensis XP ® report types

The following table lists the extensions for the image type attribute where the DICOM definitions are extended:

Attribute Name	Tag	Type	Notes
Image Type	(0008,0008)	1	Additional Defined Terms: Defined Terms for value 4: "WORD REPORT"

Table 53 Extended DICOM definitions for XA reports

A.3 SIEMENS Private Non-Image IOD

For encoding binary data-streams not representing image data, Siemens has created a private "Non-Image IOD" according to the rules governed by the DICOM Standard. The following section will define this Private IOD. It can be communicated with Network Storage Service and Offline Media Storage Services.

The Siemens "Non-Image IOD" is identified by a private Non-Image Storage SOP Class UID.

Private Non-Image Object	Private Non-Image IOD
CSA Non-Image	1.3.12.2.1107.5.9.1

Table 54 SIEMENS Private Non-Image IOD

A.3.1 Siemens Non-Image IOD – E-R Model

The E-R model in A.3.2 depicts those components of the DICOM Information Model which directly refer to the Siemens Non-Image IOD. The Frame of Reference IE, Overlay IE, Modality Lookup-Table IE, VOI Lookup-Table IE and Curve IE are not components of the Siemens Non-Image IOD.

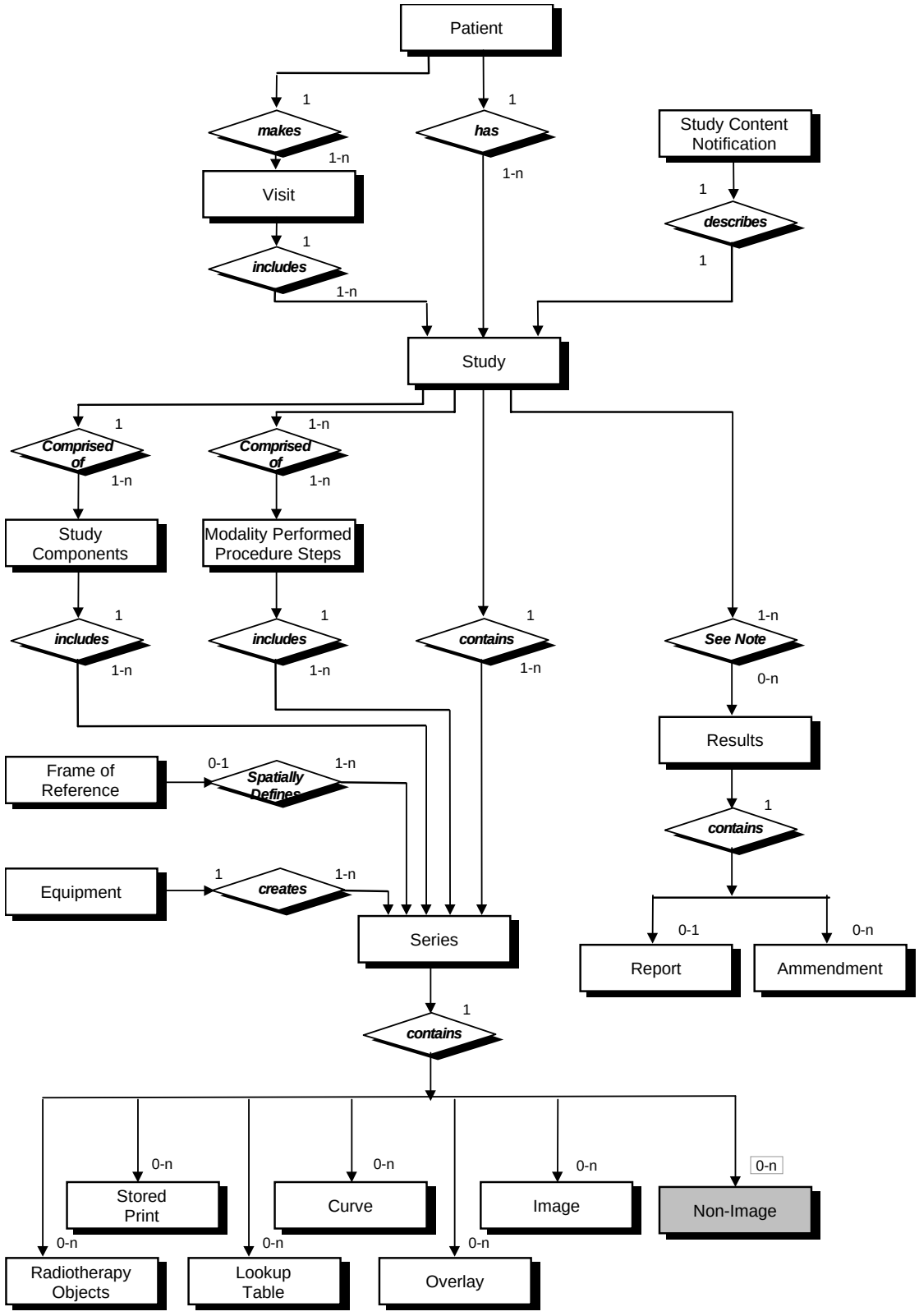

Figure 9 DICOM Information Model

A.3.2 Siemens Non-Image IOD - Module Table

IE	Module	Reference	Usage
Patient	Patient	[1] PS3.3 C.7.1.1	M
Study	General Study	[1] PS3.3 C.7.2.1	M
	Patient Study	[1] PS3.3 C.7.2.2	U
Series	General Series	[1] PS3.3 C.7.3.1	M
Equipment	General Equipment	[1] PS3.3 C.7.5.1	U
CSA	CSA Image Header	A.2.1	U
	CSA Series Header	A.2.2	U
	MEDCOM Header	A.2.3	U
	CSA Non-Image	A.1.3.1	M
	SOP Common	[1] PS3.3 C.12.1	M

Table 55 CSA Non-Image IOD Modules

A.3.3 Siemens Non-Image IOD - Modules

A.3.3.1 CSA Non-Image Attributes

The table in this section contains private IOD Attributes that describe CSA Non-Images.

Attribute Name	Tag	Owner	Type	Notes
Image Type	(0008,0008)	-	3	Image identification characteristics.
Acquisition Date	(0008,0022)	-	3	The date the acquisition of data that resulted in this data set started.
Acquisition Time	(0008,0032)	-	3	The time the acquisition of data that resulted in this data set started.
Conversion Type	(0008,0064)	-	3	Describes the kind of image conversion. Defined Terms: DV = Digitized Video, DI = Digital Interface, DF = Digitized Film, WSD = Workstation.
Referenced Image Sequence	(0008,1140)	-	3	A sequence which provides reference to a set of Image SOP Class/Instance identifying other images significantly related to this data set. Encoded as sequence of items: (0008,1150) and (0008,1155).
Derivation Description	(0008,2111)	-	3	A text description of how this data set was derived.
Source Image Sequence	(0008,2112)	-	3	A Sequence which identifies the set of Image SOP Class/Instance pairs of the Images which were used to derive this data set. Zero or more Items may be included in this Sequence. Encoded as sequence of items: (0008,1150) and (0008,1155).
Patient Position	(0018,5100)	-	3	Patient position descriptor relative to the equipment.
Acquisition Number	(0020,0012)	-	3	A number identifying the single continuous gathering of data over a period of time which resulted in this data set.
Image Number	(0020,0013)	-	3	A number that identifies this data set.
Frame of Reference UID	(0020,0052)	-	3	Uniquely identifies the frame of reference for a Series.
Image Comments	(0020,4000)	-	3	User-defined comments about the image.
Quality Control Image	(0028,0300)	-	3	Indicates whether or not this image is a quality control or phantom image.

				If this Attribute is absent, then the image may or may not be a quality control or phantom image. Enumerated Values: YES, NO.
Burned in Annotation	(0028,0301)	-	3	Indicates whether or not image contains sufficient burned in annotation to identify the patient and date the image was acquired. If this Attribute is absent, then the image may or may not contain burned in annotation. Enumerated Values: YES, NO.
Lossy Image Compression	(0028,2110)	-	3	Specifies whether an Image has undergone lossy compression. Enumerated Values: 00 = Image has NOT been subjected to lossy compression, 01 = Image has been subjected to lossy compression.
Lossy Image Compression Ratio	(0028,2112)	-	3	Describes the approximate lossy compression ratio(s) that have been applied to this image. May be multi valued if successive lossy compression steps have been applied.
CSA Data Type	(0029,xx08)	SIEMENS CSA NON-IMAGE	1	CSA Data identification characteristics. Defined Terms: BSR REPORT = Study Report Data 3D EDITOR 3D FLY PATH = Fly Through Data 3D FLY VRT = Fly Through Data 3D FUSION MATRIX = Fusion Data RAW DATA NUM 4 = NUMARIS/ Raw Data RAW DATA SOM 5 = SOMARIS/ Raw Data RT3D CONFIG = InSpaceIS Data SPEC NUM 4 = NUMARIS/4 Spectroscopy
CSA Data Version	(0029,xx09)	SIEMENS CSA NON-IMAGE	3	Version of CSA Data Info (0029,xx10) format and CSA Non-Image Data (7FE1,xx10) format.
CSA Data Info	(0029,xx10)	SIEMENS CSA NON-IMAGE	3	Information to describe the CSA Data (7FE1,xx10).
CSA Data	(7FE1,xx10)	SIEMENS CSA NON-IMAGE	2	Binary data as byte stream.

Table 56 CSA Non-Image Attributes

A.4 Siemens Standard Extended Modules

IE	Module	Reference	Usage	Note
Image	CSA Image Header	A.2.1	U	private GG information
	CSA Series Header	A.2.2	U	
	MEDCOM Header	A.2.3	U	private *syngo* information
	MEDCOM OOG	A.2.4	U	if object graphics is attached to image
	Original Image Info	A.2.9	U	if derived image

Table 57 CSA Image IOD Modules

A.4.1 CSA Image Header Module

The table in this section contains private IOD Attributes that describe the CSA Image Header:

Attribute Name	Tag	Owner	Type	Notes
CSA Image Header Type	(0029,xx08)	SIEMENS CSA HEADER	1	CSA Image Header identification characteristics. Defined Terms: NUM 4 = NUMARIS/4 SOM 5 = SOMARIS/5
CSA Image Header Version	(0029,xx09)	SIEMENS CSA HEADER	3	Version of CSA Image Header Info (0029,xx10) format.
CSA Image Header Info	(0029,xx10)	SIEMENS CSA HEADER	3	Manufacturer model dependent information.

A.4.2 CSA Series Header Module

The table in this section contains private IOD Attributes that describe the CSA Series Header:

Attribute Name	Tag	Owner	Type	Notes
CSA Series Header Type	(0029,xx18)	SIEMENS CSA HEADER	1	CSA Series Header identification characteristics. Defined Terms: NUM 4 = NUMARIS/4
CSA Series Header Version	(0029,xx19)	SIEMENS CSA HEADER	3	Version of CSA Series Header Info (0029,xx20) format.
CSA Series Header Info	(0029,xx20)	SIEMENS CSA HEADER	3	Manufacturer model dependent information.

A.4.3 MEDCOM Header Module

The table in this section contains private IOD Attributes that describe MEDCOM Header:

Attribute Name	Tag	Owner	Type	Notes
MedCom Header Type	(0029,xx08)	SIEMENS MEDCOM HEADER	1C	MedCom Header identification characteristics. Defined Terms: MEDCOM 1 (Required if MedCom Header Info (0029,xx10) present.)
MedCom Header Version	(0029,xx09)	SIEMENS MEDCOM HEADER	2C	Version of MedCom Header Info (0029,xx10) format. (Required if MEDCOM Header Info (0029,xx10) present.)
MedCom Header Info	(0029,xx10)	SIEMENS MEDCOM HEADER	3	Manufacturer model dependent information. The value of the attribute MedCom Header Info (0029,xx10) can be build up in each user defined format.
MedCom History Information	(0029,xx20)	SIEMENS MEDCOM HEADER	3	MedCom defined Patient Registration history information. See A.2.3.1.
Application Header Sequence	(0029,xx40)	SIEMENS MEDCOM HEADER	3	Sequence of Application Header items. Zero or more items are possible.
>Application Header Type	(0029,xx41)	SIEMENS MEDCOM HEADER	1C	Application Header identification characteristics. Required, if Sequence is sent.
>Application Header ID	(0029,xx42)	SIEMENS MEDCOM HEADER	3	Identification of an application header
>Application Header Version	(0029,xx43)	SIEMENS MEDCOM HEADER	3	Version of CSA Series Header Info (0029,xx44) format.
>Application Header Info	(0029,xx44)	SIEMENS MEDCOM HEADER	3	Application dependent information.
Workflow Control Flags	(0029,xx50)	SIEMENS MEDCOM HEADER	3	Eight free definable flags.
Archive Management Flag Keep Online	(0029,xx51)	SIEMENS MEDCOM HEADER	3	Flag to control remote archive management system to keep the image always online (also when already archived). Enumerated Values: 00 = remote control not required 01 = keep image online
Archive Management Flag Do Not Archive	(0029,xx52)	SIEMENS MEDCOM HEADER	3	Flag to control remote archive management system not to archive the related image. Enumerated Values: 00 = remote control not required 01 = don't archive image
Image Location Status	(0029,xx53)	SIEMENS MEDCOM HEADER	3	Image location status to control retrieving. Defined Terms: ONLINE = retrieving has to be done as usual, NEARLINE = move request to SCP and delay according to value of Estimated Retrieve Time (0029,xx54), OFFLINE = invoking a retrieve operation initiates an operator request, INVALID = invoking a retrieve operation would always result in an error.
Estimated Retrieve Time	(0029,xx54)	SIEMENS MEDCOM HEADER	3	Estimated retrieve time in seconds. A value less then zero (< 0) indicates location is OFFLINE or INVALID.
Data Size of Retrieved Images	(0029,xx55)	SIEMENS MEDCOM HEADER	3	Data size of images in MByte.
Siemens Link Sequence	(0029,xx70)	SIEMENS MEDCOM HEADER	3	Sequence of link items. Each item identify the location of one missing tag. One or more items can be included in this sequence.
Referenced Tag	(0029,xx71)	SIEMENS MEDCOM	1	The referenced tag. The value of this

		HEADER		tag is in the Child Data Object (CDO). Currently it is always Pixel Data (7FE0,0010).
Referenced Tag Type	(0029,xx72)	SIEMENS MEDCOM HEADER	1	The Value Representation (type) of the missing tag (e.g. OW). Enumerated values are all DICOM defined Value Representations.
Referenced Value Length	(0029,xx73)	SIEMENS MEDCOM HEADER	1	The length of the referenced tag value in bytes.
Referenced Object Device Type	(0029,xx74)	SIEMENS MEDCOM HEADER	1	The Device Type that stores the Child Data Object (CDO) with the referenced tag value. Currently it should be "SHMEM". In future, "SDM", "LOID" or "FILE" are also imaginable. Defined Terms are SHMEM = Shared Memory SDM = Series Data Management LOID = Database FILE
Referenced Object Device Location	(0029,xx75)	SIEMENS MEDCOM HEADER	2	The Location of the device that stores the Child Data Object (CDO) with the referenced tag value. For the “SHMEM” case, it is the shared memory directory. Can be empty, then the default directory will be taken. In future, for "SDM" this will be the SDM_ID, for FILE it will be the directory name and for "LOID" it will be the database name.
Referenced Object ID	(0029,xx76)	SIEMENS MEDCOM HEADER	1	The ID of the object that contains the Child Data Object (CDO) with the referenced tag value. In case of “SHMEM” it is the shared memory ID. In future, for “SDM” this will be a Sirius OID, for “FILE” the file name, for “DB” the LOID.
Series Work Flow Status	(0029,xx60)	SIEMENS MEDCOM HEADER2	3	syngo Patient Browser specific flags used for clinical work: • com = completed • rea = read • ver = verified

Table 58 MEDCOM Header Modules

A.4.3.1 MEDCOM History Information

The value of the attribute MEDCOM History Information (0029,xx20) is defined in the following way:

Part	Name	Type	Bytes	Notes
header	Identifier	string	32	Always “CSA HISTORY”
	Version	string	32	e.g. “V1.10”
n Items	Class Name	string	64	
	Modification String	string	1024	

Table 59 MEDCOM History Information

A.4.4 MEDCOM OOG Module

The table in this section contains private IOD Attributes that describe MEDCOM Object Oriented Graphics (OOG). This module is used whenever object graphics is drawn on the image and need to be stored as graphic object properties. Given the condition that the module contents was not removed by other modalities, the graphic objects remain re-animatable if such an image was transferred and is then retrieved back

Attribute Name	Tag	Owner	Type	Notes
MedCom OOG Type	(0029,xx08)	SIEMENS MEDCOM OOG	1	MEDCOM Object Oriented Graphics (OOG) identification characteristics. Defined Terms: MEDCOM OOG 1 MEDCOM OOG 2
MedCom OOG Version	(0029,xx09)	SIEMENS MEDCOM OOG	3	Version of MEDCOM OOG Info (0029,xx10) format.
MedCom OOG Info	(0029,xx10)	SIEMENS MEDCOM OOG	3	MEDCOM Object Oriented Graphics (OOG) data.

Table 60 MEDCOM OOG Module

The graphics objects are also fully drawn in the Image Overlay Plane for compatibility with other products, which do not support the MedCom OOG module. Any system not supporting the MedCom OOG module shall remove the OOG module and its content when modifying the image overlay plane content.

A.5 Private Non-Image IOD

The AXIOM Sensis system will create numerical data that cannot be correlated to an individual image or waveform instance and therefore need to be stored in separate instance(s). This is necessary to correlate the information in the right level of the DICOM data model hierarchy. Since there is no fitting DICOM SOP Class definition, SIEMENS has created a private "Non-Image IOD" to contain numerical data heaps to be managed within a DICOM structure. Please see previous chapters of the Appendix for IOD definition and the following tables for detailed encoding of the different "Non-Image SOP Class Instances".

Attribute Name	Tag	Value
Specific Character Set	(0008,0005)	from Configuration
SOP Class UID	(0008,0016)	1.3.12.2.1107.5.9.1
SOP Instance UID	(0008,0018)	N/A
Study Date	(0008,0020)	<yyyymmdd>
Series Date	(0008,0021)	<yyyymmdd>
Study Time	(0008,0030)	<hhmmss>
Series Time	(0008,0031)	<hhmmss>
Accession Number	(0008,0050)	RIS or "Accession Number" input
Modality	(0008,0060)	EPS
Manufacturer	(0008,0070)	Siemens
Institution Name	(0008,0080)	N/A
Performing Physician´s Name	(0008,1050)	"Performing Physician 1" \ "Performing Physician 2" input
Admitting Diagnosis Description	(0018,1080)	RIS or "Admitting Diagnoses" input
Manufacturer´s Model Name	(0008,1090)	AXIOM Sensis
Patient´s Name	(0010,0010)	RIS or "Patient Name" input
Patient ID	(0010,0020)	RIS or "Patient ID" input
Patient´s Birth Date	(0010,0030)	RIS or checked input
Patient´s Sex	(0010,0040)	RIS or input (M or F or O/unknown)
Patient's Age	(0010,1010)	calculated from "DoB" input
Patient's Size	(0010,1020)	(in meters)
Patient's Weight	(0010,1030)	(in kilograms)
Patient's Address	(0010,1040)	"Address" input"
Patient Comments	(0010,4000)	"Additional Info" input"
Study Instance UID	(0020,000D)	from RIS or system generated
Series Instance UID	(0020,000E)	N/A
Study ID	(0020,0010)	N/A
Series Number	(0020,0011)	N/A
Private Creator	(0029,00xx)	SIEMENS CSA NON-IMAGE
Data Type	(0029,xx08)	WF_PRES_DATA
Data Version	(0029,xx09)	1.0
Requested Procedure Description	(0032,1060)	from RIS
Study Comments	(0032,4000)	"Exam Comment" input
Private Creator	(7FE1,00xx)	SIEMENS CSA NON-IMAGE
Data	(7FE1,xx10)	binary data

Table 61 Overview of supplied attributes – Non-Image (WF PRES DATA)

Attribute Name	Tag	Value
Specific Character Set	(0008,0005)	from Configuration
SOP Class UID	(0008,0016)	1.3.12.2.1107.5.9.1
SOP Instance UID	(0008,0018)	N/A
Study Date	(0008,0020)	<yyyymmdd>
Series Date	(0008,0021)	<yyyymmdd>
Study Time	(0008,0030)	<hhmmss>
Series Time	(0008,0031)	<hhmmss>
Accession Number	(0008,0050)	RIS or "Accession Number" input
Modality	(0008,0060)	EPS
Manufacturer	(0008,0070)	Siemens
Institution Name	(0008,0080)	N/A
Performing Physician´s Name	(0008,1050)	"Performing Physician 1" \ "Performing Physician 2" input
Admitting Diagnosis Description	(0018,1080)	RIS or "Admitting Diagnoses" input
Manufacturer´s Model Name	(0008,1090)	AXIOM Sensis
Patient´s Name	(0010,0010)	RIS or "Patient Name" input
Patient ID	(0010,0020)	RIS or "Patient ID" input
Patient´s Birth Date	(0010,0030)	RIS or checked input
Patient´s Sex	(0010,0040)	RIS or input (M or F or O/unknown)
Patient's Age	(0010,1010)	calculated from "DoB" input
Patient's Size	(0010,1020)	(in meters)
Patient's Weight	(0010,1030)	(in kilograms)
Patient's Address	(0010,1040)	“Address” input
Patient Comments	(0010,4000)	"Additional Info" input
Device Serial Number	(0018,1000)	From Service UI
Software Version	(0018,1020)	SIEMENS AXIOM Sensis XP Software Version (VC03A, VC10, VC11, etc.)
Study Instance UID	(0020,000D)	from RIS or system generated
Series Instance UID	(0020,000E)	N/A
Study ID	(0020,0010)	N/A
Series Number	(0020,0011)	N/A
Private Creator	(0029,00xx)	SIEMENS CSA NON-IMAGE
Data Type	(0029,xx08)	EVENT_LOG_DATA or BINARY_DATA
Data Version	(0029,xx09)	5.0
Requested Procedure Description	(0032,1060)	from RIS
Study Comments	(0032,4000)	"Exam Comment" input
Private Creator	(7FE1,00xx)	SIEMENS CSA NON-IMAGE
Data	(7FE1,xx10)	binary data

Table 62 Overview of supplied attributes – Non-Image (EVENT LOG DATA, BINARY DATA)